NEW MEXICO HIGHLANDS UNIVERSITY

PROJECT MANUAL

04/04/23

Sininger Hall Renovation
New Mexico Highlands University

STATE OF NEW MEXICO
MARK REA BAKER
NO. 3226
04.04.23
REGISTERED ARCHITECT

Baker Architecture + Design
505 Central Avenue NW
Albuquerque, NM 87102

NMHU Proposal Documents
PROJECT CONTACTS

PROJECT: Sininger Hall
ADDRESS: 904 Columbia St. Las Vegas, NM 87701

OWNER:
New Mexico Highlands University
Box 9000, Las Vegas, NM 87701
(505) 454 3269
office_president@nmhu.edu
(hereinafter, “NMHU”)

OWNER’S PROJECT CONTACT:
Sylvia Baca
Facilities Management Director
Facilities Services
Box 9000, Las Vegas, NM 87701
(505) 426-2048
sbaca@nmhu.edu

OWNER’S PROCUREMENT CONTACT:
Aaron Flure,
Director of Purchasing
New Mexico Highlands University
Box 9000, Las Vegas, NM 87701
(505) 454-3053
aflure@nmhu.edu

DESIGN PROFESSIONAL OF RECORD:
Baker Architecture + Design P.C.
505 Central Avenue NW, Suite E
Albuquerque, NM 87102
(505) 254-4697
baker@bakerad.com

CONSTRUCTION MANAGER:
North Star
Clay Simmons
7020 Tesuque Drive NW
Albuquerque, NM 87120
(505) 417-7364
clays@instarnm.com

ARCHITECTURAL AND ENGINEERING FIRMS

Architectural and engineering firms participating in this project are as follows:

ARCHITECT:	Baker Architecture + Design P.C. 505 Central Avenue NW, Suite E Albuquerque, NM 87102 (505) 254-4697
MEP ENGINEER:	Testudo Engineering 7007 Wyoming Blvd NE, Suite E Albuquerque, NM 87109 (505) 554-1282
ELECTRICAL ENGINEER:	Testudo Engineering 7007 Wyoming Blvd NE, Suite E Albuquerque, NM 87109 (505) 554-1282
LEED CONSULTANT:	JD Pearl, LLC 2711 Santa Clara Ave SE Albuquerque. NM 87106 (505) 301.8792
COST ESTIMATOR:	Accurate Estimating Services 8300 Camel NE, Suite 301 Albuquerque, NM 87122 (505) 821-3010

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Advertisement Dates:
March 29 and 31, 2023

RFP Name: **NMHU Sininger Hall RFP 23-023**

NIGP Code: **91065**

Contracting Agency: **New Mexico Highlands University**

Contact Person: Aaron Flure, Director of Purchasing

Address: New Mexico Highlands University
Purchasing Department
PO Box 9000
City/State/Zip: Las Vegas, NM 87701

Telephone: 505-454-3053 **Fax:** 505-454-3109 **E-Mail:** aflure@nmhu.edu

DEADLINE FOR RECEIPT OF PROPOSALS IS AS FOLLOWS:

DATE: May 18, 2023 TIME: 03:00 PM Local time

DELIVER TO: NMHU Purchasing Dept 903 University Las Vegas, NM 87701

The date and time received will be stamped on the proposals by the NMHU Purchasing Department. Late Proposals will not be accepted. It is the responsibility of the Offeror to ensure that proposals are delivered on time to the correct address and in the correct format per the RFP Requirements.

A MANDATORY PRE-PROPOSAL CONFERENCE shall be held as follows:

DATE: **04/11/2023**
TIME: **1:00 PM Local time**
LOCATION: **Sininger Hall**
904 Columbia St
CITY/STATE/ZIP: **Las Vegas, NM 87701**

Pre-proposal meeting is mandatory for the Prime Contractors; subcontractors are encouraged to attend but are not required.

Proposal Documents may be obtained at Albuquerque Reprographics upon payment of **$200.00** for each complete set. CHECKS SHOULD BE MADE PAYABLE TO BAKER ARCHITECTURE + DESIGN. Incomplete sets will not be issued. A compact disc containing the RFP documents only is available for a fee of ten dollars ($10.00) from Albuquerque Reprographics. The successful Offeror will receive a refund of his deposit, and any unsuccessful Offeror who returns the Proposal Documents in good and complete condition within fifteen (15) days of the Proposal Opening will also receive refund of this deposit. No deposits will be returned after the fifteen day period. A copy of the RFP Document is also available online at www.nmhu.edu/purchasing under the Information for Vendor Tab by clicking on NMHU Bids.

PROPOSAL DOCUMENTS MAY BE REVIEWED AT THE FOLLOWING LOCATIONS:

1. Dodge Reports, Telephone: (505) 243-2817
2. Builder's News and Plan Room, Telephone: (505) 884-1752
3. Construction Reporter, Telephone: (505) 243-9793

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REQUEST FOR PROPOSALS #23-023
FOR CONSTRUCTION

RFP Number: 23-023

NIGP Code: 91065

Sininger Hall Renovation Las Vegas, New Mexico

March 29, 2023

New Mexico Highlands University
Department of Facilities

RFP TABLE OF CONTENTS

I. OVERVIEW OF RFP AND PROJECT

A. PURPOSE OF THIS REQUEST FOR PROPOSALS

New Mexico Highlands University (NMHU) is requesting competitive sealed proposals-request for proposals with the intent of entering into a contract with a general contractor for the purpose of providing the construction services for the project identified in this RFP. Any contract awarded as a result of this solicitation will be in effect from date of award until the completion of the project. All potential Offerors are to read, understand and accept the requirements of this Request for Proposals (RFP), especially the **mandatory requirements**.

This is a qualifications-based selection. The Offeror is required to provide, as part of the Technical Proposal, the qualifications and other documents requested in this RFP.

The award of a contract for construction shall take into consideration certain contractor qualification and performance record that add value to a procurement contract. Factors such as contractor past performance, technical expertise and experience, management capabilities and usage of resources, subcontractor teams and craft personnel resources, will form the basis for the criteria to be considered. Award shall be made in accordance with the terms conditions, and requirements stated herein.

B. PROJECT DESCRIPTION

The project is described as:
Renovation of New Mexico Highlands University's Sininger Hall building. The renovation will consist of approximately 26,373 sf designed to meet the needs of NMHU's academic goals.

C. PROJECT FUNDING

New Mexico Highlands University has funds to administer this project and will be referred to throughout the contract documents as the “Owner”. The MACC (Maximum Allowable Construction Cost) **shall not exceed $6,700,000 dollars**, includes NMGRT.

D. MANDATORY ON-SITE MEETING

Attendance at the pre-proposal meeting is mandatory. The on-site meeting will be conducted at New Mexico Highlands University Sininger Hall, 904 Columbia St. Las Vegas, NM 87701 on Tuesday, April 11, 2023 at 1:00 PM local time. All prime contractors who intend to submit a proposal for this project, must attend this meeting. A tour of the project site will be conducted.

E. PROPOSAL SECURITY

Offeror shall provide proposal security in the form of a surety bond executed by a surety company authorized to do business in the State of New Mexico in the amount of **5%** of the total price proposal, or the equivalent in cash by means of a cashier's check or in a form satisfactory to the Owner, must accompany each price proposal.

The Offeror will provide, with the proposal, a notarized declaration from a bonding company licensed to do business in the State of New Mexico confirming the Offeror’s ability to obtain Performance; Labor, and Materials Payment Bond in an amount not less than 100% of the price proposal.

F. SUBCONTRACTOR LISTING FORMS

This RFP includes two Subcontractor Listing Forms, each with its own value threshold and separate meaning. The “Combined List of Subcontractors and Assignment of Anti-Trust Claims” is included as Appendix C and must be completed and included in the Price Proposal. The “Listing Form 00 4334 for Submission of Subcontractor Qualifications Questionnaires” is included as Appendix I and must be completed and included in Tab 3 of the Technical Proposal.

G. NEW MEXICO PREVAILING WAGE RATES

Wages to be paid as a result of a contract awarded for this project will be subject to the minimum wage rate determination by the State of New Mexico, which is included in the Project Manual. This determination will become part of the contract by reference and must be posted, per State of New Mexico Statutes, in a conspicuous place at the General Contractor’s place of business. It is the General Contractor’s responsibility to be aware of the applicable State of New Mexico statutes and responsibilities related thereto. Failure by the Owner to physically make such minimum wage rate determinations available to the General Contractor will not relieve the General Contractor from becoming aware of or complying with such determinations.

H. PERMITS, PLAN CHECKING FEES, OTHER CHARGES

Offerors shall include as part of the Price Proposal all costs incurred for permits relating to this scope of work, including any Plan Checking Fees as charged by the State of New Mexico (or any other applicable entity or agency with jurisdiction over the project) for checking Contract Documents prior to obtaining a building permit. Additionally, the Owner will not pay for business licenses, professional affiliations and similar costs of doing business which are the Offeror's obligation to secure and maintain. The cost of all bonding will be paid by the Offeror and will not be paid by the Owner. These costs are to be included in Offeror’s Price Proposal.

I. METHOD OF AWARD:

This Procurement is being conducted in accordance with Section §13-1-112 NMSA 1978 Competitive sealed proposals; request for proposals. Method of Award will be done according to Section §13-1-117 NMSA 1978 Competitive sealed proposals; award. The Owner will rate the Offerors and will ask the top three to make presentations to the University Board of Regents as part of the overall selection process, and will be asked to respond to questions and explain why their firm is the best and most qualified to perform this project. The NMHU Board of Regents is the official and final decision-making authority for the selection of the firm. The Owner reserves the right to reject any and all proposals, to waive technical irregularities, and to award the contract to the Offeror whose proposal it deems to be in the best interest of the University.

***NOTE: Please read all of the RFP documents carefully for mandatory requirements.**

II. CONDITIONS GOVERNING THE PROCUREMENT

This section lists the major events of the Selection Process and specifies general requirements.

A. SEQUENCE OF SOLICITATION PROCESS EVENTS

EVENT	RESPONSIBLE PARTY	DATE	LOCATION
1. Advertisement of Construction RFP	NMHU Procurement	March 29, 2023	Public Advertisement
2. RFP and Construction Documents Made Available to Potential Offerors	Contract Architect	April 4, 2023	Albuquerque Reprographics, Albuquerque, NM
3. Mandatory Pre-proposal Conference (Site Visit)	NMHU Facilities and Design Professional(s)	Tuesday, April 11, 2023 @ 1:00 PM	NMHU Sininger Hall 904 Columbia Ave. Las Vegas, NM 87701
4. Submission of Written Questions	Potential Offerors	Friday, April 28, 2023, by 3pm	Sent to Design Professional's office
5. Submission of Requests for Prior Approval of Product Substitutions	Potential Offerors	May 1, 2023, before 3:00 PM deadline	Sent to Design Professional's office
6. Release of Last Addendum Prior to Submission of Proposals	NMHU Facilities and Design Professional	Wednesday, May 3, 2023 by 3pm	Issued to All Potential Offerors
7. Submission of Proposals	Offerors	Thursday, May 18, 2023 by 3pm	NMHU Purchasing Dept 903 University Las Vegas, NM 87701
8. Submission of Subcontractors' Qualifications Forms	Offerors	Tuesday, May 23, 2023 by 3pm	NMHU Purchasing Dept 903 University Las Vegas, NM 87701
9. Proposal Evaluation	Evaluation Committee	May 22, 2023 - May 26, 2023	NMHU Facilities Offices
10. Committee rating discussion	NMHU Procurement	May 26, 2023 @ 10am	NMHU Sininger Hall
11. Notice of Finalists and recommendation to NMHU Board of Regents	NMHU Procurement	TBD 2023	NMHU Facilities Office
12. Interviews of Finalists – NMHU Board of Regents	NMHU	TBD June 2023	NMHU Board Meeting
13. Notice of Intent to Award	NMHU	TBD 2023	NMHU
14. Contract Negotiations Completed	NMHU & Successful Offeror	TBD 2023	NMHU Facilities Offices
15. Notice of Award	NMHU Facilities	TBD 2023	NMHU
16. Construction (Start to Completion)	Selected Contractor	July 2023 – June 2024 (11 months)	NMHU Sininger Hall

NOTICE: NMHU reserves the sole right, without incurring any liability, to change any aspect of the proposed procurement described above, including the right not to proceed with the procurement and/or the right to proceed in a different manner or on a different timeline than as described above.

B. EXPLANATION OF SOLICITATION PROCESS EVENTS

1. Issue RFP

This RFP is issued by New Mexico Highlands University in accordance with the provisions of Sections §13-1-112 and §13-1-117 NMSA 1978.

The Request for Proposals (RFP) documents consist of all the documents listed in the Table of Contents and all documents incorporated in this RFP by reference, including the complete Project Manual, Technical Specifications, and Construction Drawings.

2. RFP and Construction Documents Made Available to Potential Offerors

Proposal Documents (RFP, construction drawings, & specifications) may be obtained at Albuquerque Reprographics upon payment of **$200.00** for each complete set. CHECKS SHOULD BE MADE PAYABLE TO NEW MEXICO HIGHLANDS UNIVERSITY. Incomplete sets will not be issued. A compact disc containing the RFP documents only is available for a fee of ten dollars ($10) at Albuquerque Reprographics. The successful Offeror will receive a refund of his deposit, and any unsuccessful Offeror who returns the Proposal Documents in good and complete condition within fifteen (15) days of the Proposal Opening will also receive a refund of this deposit. No deposits will be returned after the fifteen-day period.

RFP & Construction Documents may be reviewed at the following locations:

Design Professional of Record: **Baker Architecture + Design, P.C.**
Address: **505 Central Avenue NW, Suite E**
Albuquerque, NM 87102
Telephone: 505-254-4697

1. Dodge Reports, 1615 University Boulevard NE, Albuquerque, NM 87102Telephone: (505) 243-2817
2. Builder's News and Plan Room, 3435 Princeton Drive NE, Albuquerque, NM 87107 Telephone: (505) 884-1752
3. Construction Reporter, 1609 Second Street NW, Albuquerque, NM 87102 Telephone: (505) 243-9793

3. Mandatory On-Site Meeting

This meeting provides potential Offerors an opportunity to request clarification about the procurement process and discuss the intent of the project with NMHU Facilities and the user. A representative from each interested prime contractor is required to attend. Subcontractors and suppliers are invited to attend this meeting but it is not mandatory for them.

THE PRIME CONTRACTOR'S ABSENCE FROM THE MANDATORY ON-SITE MEETING PRECLUDES PARTICIPATION AS AN OFFEROR ON THIS PROJECT.

During the meeting a presentation will be made to describe the overall scope of work and intended schedule. This meeting will include a tour of the project site and existing facilities. In addition to attending the pre-proposal meeting, Prospective Offerors shall visit the site and understand the local conditions and restrictions under which the Work will be performed.

If attendees of the pre-proposal meeting have any questions that cannot be answered at that time they will be addressed in a subsequent addendum.

4. Submission of Requests for Prior Approval of Product Substitutions

Requests for prior approval of product substitutions shall follow the requirements of Project Manual Section 01 6300-1 Product Substitution Procedures, including submitting the Prior Approval Substitution Request Form 01 6310-1. The deadline for requests is set at least 10 calendar days prior to the Proposal Submission date to allow the Design Professional to evaluate the request and respond in an addendum.

5. Submission of Written Questions

This deadline for the submission of written questions is set at least 13 calendar days prior to the Proposal Submission to allow the NMHU and the Design Professional to respond in an addendum.

During the period of the bidding, your points of contact (hereinafter called "POC") will be limited to the Design Professional and Aaron Flure, Director of the Purchasing Department. The Design Professional and Mr. Flure have been designated as the contact persons for this RFP. No Offeror may contact any NMHU employee, officer or member of the Board of Regents other than Mr. Flure regarding this RFP through the date of the Contract. Any Proposer who makes such unauthorized contact shall be deemed to have violated the terms and conditions of this RFP and Offeror's proposal may be rejected as a result.

All questions, both those regarding the selection process and those regarding technical construction issues, shall be submitted in writing to the Design Professional, who will route them to NMHU Procurement and/or NMHU Facilities Design & Construction, as required.

Responses to all questions will be incorporated into Addenda issued subsequently by the Design Professional.

Design Professional:

Tomas Sanchez
Baker Architecture + Design, P.C.
505 Central Avenue NW, Suite E
Albuquerque, NM 87110
Telephone: 505-254-4697
Fax: 505-254-4697
E-mail: sanchez@bakerad.com

NMHU Procurement Contact: **Aaron Flure**
Director of Purchasing
Box 9000
Las Vegas NM, 87701
Telephone: 505-454-3053
Fax: 505-454-3053
E-mail: aflure@nmhu.edu

6. Last Addendum Prior to Submission of Proposals

This is the deadline by which the Design Professional must issue all addenda for the project so that Offerors have time to finalize their proposals, and is set at least 3 calendar days prior to the Proposal Submission. The only exception to this deadline is issuance of an addendum that postpones the date for the Submission of Proposals.

By this deadline, the Design Professional (in consultation with NMHU Procurement and NMHU Facilities) shall have responded by addendum to all properly submitted Requests for Prior Approval and all properly submitted written questions.

All addenda shall become part of the Request for Proposals and any information required shall be included in each Offeror's proposal. The Design Professional will distribute all addenda in writing to all recipients of the RFP.

7. Submission of Proposals

a) Receipt of Proposals:

Each proposal will consist of Volume 1 - Technical Proposal (one original and five copies) and the Volume 2 - Price Proposal (one original). These two volumes shall be submitted in two separate sealed envelopes or packages. Clearly label each envelope or package with the RFP number, volume number & name, Offeror's name, address and date of submittal.

Offeror shall deliver proposals to:

New Mexico Highlands University
903 University Ave (Purchasing Building)
Las Vegas, NM 87701
ATTENTION: Aaron Flure, Director of Purchasing
Telephone: 505-454-3053

All Proposals must be submitted in a SEALED envelope. The outer package MUST specify that it is for **"Request for Proposals #23-023"**. Failure to mark the sealed envelope may result in the Proposal being opened early or later and/or the Proposal may be declared non-responsive. NMHU will make the determination.

It is solely the Offeror's responsibility to ensure that Proposals arrive at the appointed date, time and location. Proposals may be delivered early to avoid any possible delay of the submission.

Proposals may be hand carried/delivered or shipped/mailed by common carrier, courier of US Postal Service. **No other method of delivery will be allowed. Telephone, telegraphic, facsimile and email offers will NOT be accepted.**

b) Opening of Proposals:

In accordance with §13-1-116 NMSA 1978, proposals will NOT be opened publicly and shall not be open to public inspection until after an Offeror has been selected for award of the contract. The NMHU Purchasing Department will designate one or more witnesses to be present during the opening of the proposals. The witness(es) and Purchasing Department will sign a document identifying the offerors' proposal contents for the procurement file.

8. Submission of Subcontractors' Qualifications Forms

This is the deadline by which the Offerors must have submitted all required copies of the Subcontractors' Statements of Qualifications for Tab 3 of the original Technical Proposal AND must have submitted all required copies of the complete Technical Proposal. This provision is allowed so that an Offeror's submission is not jeopardized due to the volume of copies that must be made and collated. **(IMPORTANT: The Offeror must already have submitted one original of the "Listing Form 00 4334 for Submission of Subcontractor Qualifications Questionnaires" behind Tab 3 of the Technical Proposal by the deadline for Submission of Proposals).**

9. Proposal Evaluation

The Evaluation Committee will meet to review all proposals. The technical proposal evaluation will be scored independently of the price proposal. The Evaluation Committee may decide to hold interviews with the highest-ranked Offerors. If fewer than three proposals are received, the Evaluation Committee may recommend reissue of the RFP.

10. Notice of Finalists

NMHU Procurement shall notify all Offerors in writing stating which Offerors will be invited to interview at the next scheduled Board of Regents meeting.

11. Interviews of Finalists

The date, time, and location of the Interview Meeting will be included with the notice to those Offerors selected for interview. A list of potential questions shall be distributed to the Finalist Offerors.

NOTE: A "Pre-Interview" meeting may be held by NMHU Procurement, if it is determined it is in the best interest of the short-listed Offerors and the Project, to answer questions regarding the interview process.

12. Professional Courtesy Letter

NMHU Procurement shall prepare a Courtesy Letter to all Offerors stating which Offerors are being recommended to the Board of Regents for an interview.

NMHU Procurement will maintain at least one copy of each Offeror's proposal. Proposals remain the property of NMHU and are open for public inspection after the award and conclusion of successful contract negotiations.

13. Notice of Intent to Award

NMHU shall prepare the Notice of Intent to Award to notify the successful Offeror in writing of their selection for a tentative contract award.

14. Contract Negotiations

The Owner reserves the right to enter into negotiations with the apparent successful Offeror per §13-1-115 NMSA 1978, and will begin contract negotiations as soon as possible after the Notice of Intent to Award. If contract negotiations are not finalized within a reasonable period of time, the Owner may conclude negotiations with the selected firm and begin negotiations with the next ranked firm based on final ranking.

15. NMHU Board of Regents Approval

NMHU Board of Regents shall provide their recommendation of the Offeror of whom NMHU will enter into contract negotiations with for the project after a discussion and vote by the Board in closed session. The Board will then announce their selection in open session.

16. Notice of Award

NMHU shall prepare the Notice of Award and send it to the selected Offeror.

C. STANDARD CONDITIONS GOVERNING THE PROCUREMENT

This section contains guidelines under which this RFP is issued, and conditions concerning how the project will be completed.

The Owner may evaluate the Proposals based on the anticipated completion of all or any portion of the Project. The Owner reserves the right to divide the Project into multiple parts, to reject any and all Proposals and re-solicit for new Proposals, or to reject any and all Proposals and temporarily or permanently abandon the Project, should the need arise. Owner makes no representations, written or oral, that it will enter into any form of agreement with any Offeror.

1. Protests

In accordance with Section §13-1-172 NMSA 1978, any Offeror who is aggrieved in connection with a solicitation or the award of a contract may protest to the Procurement Director. The protest must be submitted in writing within fifteen (15) calendar days after knowledge of the facts or occurrences giving rise to the protest. Protests must be submitted in written form to:

New Mexico Highlands University
Attn: Aaron Flure
P.O. Box 9000
Las Vegas, NM 87701

Or aflure@nmhu.edu

The protest letter shall include the name and address of the protestant, the solicitation number, and a statement of the grounds for protest, including appropriate supporting exhibits.

2. Incurring Cost

Any cost incurred by the Offeror in preparation, transmittal, or presentation of any proposal or material submitted in response to this RFP shall be borne solely by the Offeror.

3. Third-Party or Subcontracting GC Contract Responsibilities

Direction of all work that may result from this procurement must be performed by the Offeror and payments will only be made to the Offeror. Use of consultants identified in the proposal is permitted, but since the award is made on a quality-based evaluation process, reassignment of GC duties and responsibilities to a third party is not acceptable.

4. Amendments or Modifications to a Proposal by Offeror

An Offeror may submit an amended proposal prior to the deadline for receipt of proposals. Such an amended proposal must be a complete replacement for a previously submitted proposal and must be clearly identified as such in the transmittal letter. Owner personnel will not collate or assemble proposal materials for the Offeror.

5. Offeror's Rights to Withdraw Proposal

No Offeror may withdraw their proposal for **5 days** after the actual date of the receipt thereof (Proposal Due Date).

6. Disclosure of Proposal Contents

In accordance with §13-1-116, Proposal contents will be kept confidential until conclusion of successful contract negotiations.

7. Confidential Data

Confidential data is normally restricted to confidential financial information concerning the Offeror's organization and data that qualifies as a trade secret under the Uniform Trade Secrets Act, Sections NMSA 1978 §57-3A-1. Any pages of a proposal on which the Offeror has stamped or imprinted "proprietary" or "confidential" must be readily separable from the proposal in order to facilitate public inspection for the non-confidential portion of the qualifications-based proposal.

8. Termination of RFP

This RFP may be canceled at any time and any and all proposals may be rejected in whole or in part when the Owner determines such action to be in the best interest of NMHU. The RFP process may be terminated at any time if sufficient appropriations or authorizations do not exist. Such termination will go into effect by sending written notice to the Offeror. The NMHU Facility's decision as to whether sufficient appropriations and authorizations are available will be accepted by the Offeror as final.

9. Sufficient Appropriation

Any contract awarded as a result of this RFP process may be terminated if sufficient appropriations or authorizations do not exist. Such termination will go into effect by sending written notice to the contractor. The Owner's decision as to whether sufficient appropriations and authorizations are available will be accepted by the contractor as final.

If the determination is made that there is insufficient funding to continue or finalize a project, the successful Offeror will be compensated to the level of effort performed, as authorized by the Owner prior to that determination.

10. Offeror Qualifications

The Evaluation Committee may consider any relevant information or data, from any reliable source (references) relating to the RFP evaluation criterion and the Offeror's ability to successfully perform the project. Such information may be obtained from the Offeror's prior customers, commercial and public databases or other reliable sources. The Offeror shall furnish to Owner all such information and data for this purpose as Owner may request including but not limited to proof of financial resources, production or service facilities, personnel and experience adequate to complete the project. Owner reserves the right to reject any Proposal if the evidence submitted by, or investigation of, such Offeror fails to satisfy Owner that such Offeror is qualified to carry out the obligations of the Contract and

to complete the work described therein.

The Evaluation Committee may reject the proposal of any Offeror who is not a responsible Offeror or fails to submit a responsive offer as defined in Sections §13-1-83 and §13-1-85 NMSA 1978.

11. Right to Waive Technical Irregularities

NMHU reserves the right to waive technical irregularities, in accordance with §13-1-132 NMSA 1978 see "Technical Irregularities" in Definitions and Terminology section below). The Evaluation Committee also reserves the right to waive mandatory requirements provided that all of the otherwise responsive proposals failed to meet the same mandatory requirements and the failure to do so does not otherwise materially affect the procurement. This right is at the sole discretion of the Evaluation Committee.

12. Potential Civil and Criminal Penalties

The Procurement Code, Sections §13-1-28 through §3-1-199 NMSA 1978, imposes civil and misdemeanor criminal penalties for its violation. In addition, the New Mexico criminal statutes impose felony penalties for bribes, gratuities and kickbacks.

13. Release of Information

Only the Owner, and the Design Professional when acting as the Owner's representative, are authorized to release information about the project(s) covered by this RFP. The Offerors must refer to the Owner any requests to release any information that pertains to the work or activities covered by any action or award related to this RFP.

All requests for information must be submitted to:

New Mexico Highlands University
Attn: University Relations/IPRA
P.O. Box 9000
Las Vegas, NM 87701

14. Clarifications from Offerors

The Evaluation Committee, after review of the proposals and/or Interviews may request clarifications on information submitted by any and all Offerors in a written format, with a specified deadline for response.

15. Licensing Requirements

The Contractor and subcontractors shall comply with all licensing laws and regulations. The Contractor shall, as part of the proposal, provide copies of all of the Contractor's valid licenses necessary to perform the work in the State of New Mexico. Copies of the subcontractors' licenses need be provided only if requested by the Owner.

16. Subcontractors

The Subcontractors Fair Practices Act, §13-4-31 NMSA 1978, applies to this procurement. Therefore, any request for substitution on the part of the Owner or the Offeror shall comply with this section.

Since the award is made on a qualification-based evaluation process, replacement of subcontractors after award and prior to contract execution may cause the Offeror to be disqualified.

17. Objection to Pre-Listed Subcontractors

Prior to the award of the Contract, the Design Professional will notify the Offeror, in writing,

if either the Owner or the Design Professional, after due investigation, has reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization, the Offeror may, at their option, (1) withdraw their bid, or (2) submit an acceptable substitute Subcontractor with no increase in the bid price. In the event of withdrawal under this paragraph, Bid Security will not be forfeited, notwithstanding anything to the contrary elsewhere in this RFP.

18. Non-Conforming Proposals

Proposals will be reviewed, for completeness, format and compliance with the requirements of the RFP. Incomplete proposals will be considered non-responsive and subject to rejection.

Proposals that are qualified with conditional clauses, alterations, items not called for in the RFP documents, or irregularities of any kind are subject to rejection by the Owner, at its option. If any proposal is deemed non-responsive by the Evaluation Committee, the Offeror will be notified in writing of such determination.

D. DEFINITIONS AND TERMINOLOGY

This section contains definitions that are used throughout this Request for Proposals (RFP), including appropriate abbreviations.

"Architect" means a member of the project team who is a New Mexico licensed architect and is responsible for the architectural services.

"Award of Contract" shall mean a formal written notice by NMHU that a firm has been selected to enter into negotiations for a contract for construction services.

"Construction Contractor" means successful Offeror awarded the contract that holds a current State of New Mexico general contractor license designation of GB-98.

"Contract" means an agreement between New Mexico Highlands University and a New Mexico licensed contractor for the work covered by this RFP.

"Contract Documents" means any one, or combination, of the following documents: Request for Proposal, Addenda, Agreement Between the Owner and the General Contractor for Construction, General Conditions of the Contract for Construction, and the drawings and specifications.

"Contractor" means any person, corporation, or partnership that has entered into a contract with a state agency or a local public body.

"Design Professional" means architect or engineer.

"Determination" The written documentation of a decision made by the Evaluation Committee including findings of fact required to support a decision. A determination becomes part of the procurement file to which it pertains.

"Engineer" means a member of the project design team who is a New Mexico licensed engineer and is responsible for the engineering services.

"Evaluation Committee" A body formed by NMHU to evaluate proposals and make selection recommendation and or selection. The Evaluation Committee consists of at least five members. The committee should collectively possess expertise in the technical requirements of the project, construction, design and contracting. The Evaluation Committee is chaired by the Director of the Facilities. The NMHU Purchaser serves as staff to the Evaluation Committee.

"Firm" means the company or other business entity for the purpose of identifying, individually or collectively: a general contractor, a prime contractor or a subcontractor, of any tier, whether basic trade subcontractor, subcontractor or other.

"General Provisions" - The terms **"can," "may," "should," "preferably,"** or **"prefers"** identifies a desirable or discretionary item of the RFP. Failure to comply with such an item will not result in the rejection of the Offerors proposal.

"LEED®" (Leadership in Energy and Environmental Design) Green Building Rating System™ is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings, created and administered by the U.S. Green Building Council.

“Mandatory Requirements” - The terms **“must,” “shall,” “will,” “is required,”** or **“are required”** identify a mandatory requirement of this RFP. Failure to comply with such a mandatory factor may result in the rejection of the Offeror’s proposal. Rejection of the proposal will be subject to review by the Evaluation Committee and a final decision on rejection will be made by NMHU.

“Offeror” is any person, corporation, or partnership who chooses to submit a proposal in response to this RFP, with the intent of providing construction services for this project.

“Owner”, as defined in the Agreement Between the Owner and Contractor, shall be New Mexico Highlands University.

“Owner’s Project Team” is comprised of the NMHU Facilities and others in the Departments of NMHU, Progressive Construction Management staff and the Design Professional’s design team.

“Pre-listed subcontractors” means the subcontractors, of any tier, that the Offeror is required to list at the time it submits a proposal in response to this request for proposals.

“Prime Contractor” means the New Mexico licensed contractor selected for this project by the NMHU Evaluation Committee.

“Project Architect, Project Engineer, Contract Engineer or Contract Architect” means architect/engineer.

“**Project Design Team or Contract Architect or Engineer Design Team”** All members of the Design Professional’s firm, including its consultants, who are responsible for the design of and who will be participating in the construction and completion of the project.

“Proposal” is the Offeror’s response to this RFP.

“Request for Proposals” or **“RFP”** means this document, any attachments incorporated by reference, and any addenda issued for use in soliciting proposals for construction of this project.

“Resident Business” or “Resident Contractor” means an entity that has a valid resident certificate issued by the NM Taxation and Revenue Department pursuant to Section §13-1-22 NMSA 1978.

“RFP documents” means any one or any combination of the following documents: Request for Proposals, technical proposal; price proposal; financial proposal; contractor’s qualifications statement; and subcontractor’s qualification statement, contracts or agreements.

“Responsive Offer” or “Responsive Proposal” An offer or proposal which conforms in all material respects to the requirements set forth in the RFP as determined by the NMHU Evaluation Committee/NMHU Procurement. Material respects of an RFP include, but are not limited to, price, quality, quantity or delivery requirements.

"Responsible Offeror" means an Offeror who submits a responsive proposal and who has furnished, when required, information and data to prove that his financial resources, production or service facilities, personnel, service reputation and experience are adequate to make satisfactory delivery of the services described in the proposal.

“Selection” A formal written notice by the NMHU Purchasing Department that a firm has been selected to enter into a contract to provide this service.

“Construction Manager” The person designated as the point of contact by NMHU to act on its behalf, concerning the scope of work and requirements of the contract documents for the project.

“Statement of Qualifications Forms” means the forms included as a part of this RFP, which all Offerors shall complete, including the qualifications for the Team member or partners and subcontractors proposed for the project.

“Technical Irregularities” Are matters of form rather than substance evident from the proposal document, or insignificant mistakes that can be waived or corrected without prejudice to other Offerors; that is, when there is no effect on price, quality or quantity. The Evaluation Committee / NMHU Procurement may waive such irregularities, or allow an Offeror to correct them, if either is in the best interest of NMHU. Examples include the failure of an Offeror to:

a) Submit the number of signed proposals required by the RFP;

b) Sign the proposal, but only if the unsigned proposal is accompanied by other material indicating the Offeror’s intent to be bound; or

c) Acknowledge receipt of an addendum to the RFP, but only if: a) it is clear from the proposal that the Offeror received the amendment and intended to be bound by its terms; or b) the amendment involved had no effect on price, quality or quantity.

"User" means the NMHU staff occupying the facility or facilities, for which a project is being designed.

"User Contact" is the person designated by the University to speak on behalf of the staff concerning the scope of work and programming requirements for the project.

“Veteran Resident Contractor” - is a contractor that has applied to the NM Taxation and Revenue Department, qualified, and been issued a valid Veteran Resident Preference Certificate pursuant to Section §13-1-22 NMSA 1978.

III. CONTRACTUAL AGREEMENT AND BONDS

1. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

The agreement for the work shall be the NMHU Standard Form of Agreement Between the Owner and Contractor, 2008 Edition and General Conditions, 2008 Revision 1, with the basis of payment as a Stipulated Sum. This document is printed in its entirety in the Project Manual.

2. COMPLETION TIME AND LIQUIDATED DAMAGES:

The Project Proposal Documents contain a time for completion of the work and impose liquidated damages for failure to complete the work within the stated time period. These items are stated in the Article 3 of the Agreement between the Owner and the Contractor form included in the Project Manual.

3. PERFORMANCE & LABOR AND MATERIALS PAYMENT BONDS

a) A 100% Performance Bond and a 100% Payment and Materials Bond executed by a surety company authorized to do business in the State of New Mexico and listed in the United State treasury department circular 570 shall be required from the successful Offeror prior to award of contract. The Performance and Labor and Materials Payment Bonds shall be AIA Document A312. The amount of the Bonds shall be the proposal price exclusive of gross receipts tax.

b) Refer to Document #00 6000 – 1 – Bonds and Insurance, included in the Project Manual.

4. TIME OF DELIVERY AND FORM OF BONDS

a) The Offeror will, prior to commencement of Work, furnish such bonds.

b) The bonds will be written on the AIA Document A312, Performance Bond and Labor and Material Payment Bond.

c) The AIA A312 1984 Labor and Materials Payment Bond shall in effect, limit the time line Surety has to respond. The bond shall be modified as follows:

> Paragraph 6 of this Payment Bond is deleted in its entirety and replaced with the following provision: Within 45 days (1) after the claimant has satisfied the conditions of Paragraph 4 and (2) after the Surety has received at its home office all supporting documentation it requested to substantiate the amount of the claim, the Surety shall pay or arrange for payment of any undisputed amounts. Failure of the Surety to satisfy the above requirements shall not be deemed a forfeiture or waiver of the Surety's or the Contractor's defenses under this Bond or their right to dispute such claim. However, in such event the claimant may bring suit against the surety as provided under this bond.

5. SUBCONTRACTOR BONDING

Each subcontractor shall provide a performance and payment bond on a public works construction project if the subcontractor's contract (to the Contractor) for work to be performed on a project is one hundred twenty-five thousand dollars ($125,000) or more. Failure of a Subcontractor to provide required bond shall not subject the Owner to any increase in cost due to approved substitution of Subcontractor.

IV. PROPOSAL RESPONSE FORMAT AND ORGANIZATION

A. NUMBER OF PROPOSALS

Each Offeror's proposal shall be submitted in two parts:

Volume I: Technical Proposal
Volume II: Price Proposal.

Only one (1) complete original proposal may be submitted by each Offeror for this project.

B. SUBMISSION OF ORIGINAL PROPOSALS

1. By the date and time of Submission of Proposals, Offeror shall submit one (1) original copy each of the following documents:

Original Technical Proposal with required information as follows:

___Tab 1 Letter of Submittal
___Tab 2 General Contractor Statement of Qualifications and Attachments
___Tab 3 Subcontractor Qualifications Listing Form 00 4334 and Subcontractors' Statements of Qualifications and Attachments. (**Subcontractors' Statements of Qualifications may be initially excluded if the Offeror chooses to submit these items within 24 hours, as explained below. However, Listing Form 00 4334 must be included in the initial original Technical Proposal before the Proposal Submission deadline.)**
___Tab 4 Past Performance
___Tab 5 Project Staffing
___Tab 6 Management Plan
___Tab 7 Health and Safety
___Tab 8 Capability of Firm

Original Price Proposal sealed in separate envelope to include:

___ Item 1 Price Proposal Form (with all requested information provided)
___ Item 2 Proposal Security (Bond or Cash), Agent's Affidavit
___ Item 3 Notarized Declaration Letter from Surety
___ Item 4 Certificate of Insurance
___ Item 5 Subcontractors Listing Form (including Subcontractor Listing Requirements and Assignment of Antitrust Claims)
___ Item 6 Resident Contractor (or Veteran Resident Contractor) Preference Certificate
___ Item 7 Campaign Contribution Disclosure Form
___ Item 8 Conflict of Interest and Debarment/Suspension Certification Form
___ Item 9 Contractor's U.S. Internal Revenue Service W-9 Form
___ Item 10 Offeror's Contractor's License(s)

C. SUBMISSION OF REQUIRED COPIES OF PROPOSALS

1. Within 24 hours of the date and time of Submission of Proposals, Offeror shall submit five (5) additional complete copies of the Technical Proposal, as shown below.

___	Tab 1	Letter of Submittal
___	Tab 2	General Contractor Statement of Qualifications and Attachments
___	Tab 3	Subcontractor Qualifications Listing Form 00 2020 and Subcontractors' Statements of Qualifications and Attachments, as listed on Listing Form 00 2021.
___	Tab 4	Past Performance
___	Tab 5	Project Staffing
___	Tab 6	Management Plan
___	Tab 7	Health and Safety
___	Tab 8	Capability of Firm

2. If Offeror has chosen to initially exclude the Subcontractors' Statements of Qualifications items from the original Technical Proposal, then, within 24 hours of the Submission of Proposals deadline, the Offeror must submit one (1) original of the Subcontractors' Statements of Qualifications materials, to be added to Tab 3 of the original Technical Proposal. Offeror must also, within 24 hours of the Submission of Proposal deadline, have submitted five (5) additional complete copies of the Technical Proposal (clearly labeled as "copies").

   The option to submit additional copies up to 24 hours after the Submission of Proposals is provided so that an Offeror's submission is not jeopardized due to the volume of copies that must be made and collated. If the Offeror prefers not to exercise this option, all copies may be submitted initially by the Submission of Proposals date and time.

   IMPORTANT: Copies of the Subcontractor's Statements of Qualifications and Attachments must align with the Subcontractor Qualifications Listing Form 00 4334 submitted in Tab 3 of the original Technical Proposal. Any substitution of a subcontractor shall be executed per the Subcontractors Fair Practices Act

3. **DO NOT** submit additional copies of the Price Proposal. Only the original Price Proposal is necessary.

After award of a contract, all Offerors of record may make arrangements with NMHU to have their proposal copies returned or picked up. The original proposal documents will remain the property of NMHU. NMHU shall not be responsible for any shipping or mailing costs to return the proposal copies. If Offeror does not request the return of proposals within a reasonable period of time, NMHU will shred and destroy them.

D. DETAILED REQUIREMENTS FOR PROPOSAL SUBSECTIONS

VOLUME I – TECHNICAL PROPOSAL

A. Technical Proposal Format

Proposals shall be submitted in a spiral or three-ring binder. Page format shall be 8-1/2" x 11" with foldout sheets (if any) allowed up to 11" x 17" in size. Foldout pages shall be

counted as two pages **and shall be numbered as such**. Text will be no smaller than 10 point. **No information shall be submitted on electronic media.**

Proposals shall not exceed 30 pages total for all of the tabbed sections listed below. Each sheet face that is printed with text or graphics counts as one page. Tab Dividers do not count as pages provided the only text or graphics on the dividers are the tab numbers and section titles:

Tab 1 – Letter of Submittal
Tab 4 – Past Performance
Tab 5 – Project Staffing
Tab 6 – Management Plan
Tab 7 – Health and Safety
Tab 8 – Capability of Firm

Any response that exceeds the referenced page limitation shall have a deduction of 20 points taken from each evaluation committee member's Technical Proposal score. If there are any questions regarding format requirements, please contact the NMHU Procurement Contact prior to submission of Documents.

B. Tabs/Evaluation Categories:

All sections shall be separated by numbered tabs that correspond to the Submission Requirements and Evaluation Categories, 1 through 8, as shown below. Within Tab 3, provide Sub-Tabs to separate and label each Subcontractor's Statement of Qualifications. Pages within each Tab shall be numbered consecutively.

EXPLANATION OF ITEMS TO BE INCLUDED IN TECHNICAL PROPOSAL:

TAB 1 – LETTER OF SUBMITTAL

Each proposal must be accompanied by a submittal letter. **Any submittal letter that omits any of the following information may be deemed 'non-responsive.'** The submittal letter shall include acknowledgment and, where appropriate, certification of the following:

1. Identify the name(s), title(s), telephone number(s), fax number(s) and e-mail address(es) of the person or persons who have authority to contractually obligate the Offeror for the purpose of this RFP and who has sufficient knowledge to fully address all matters and respond to all inquiries included in the RFP submittal. The Letter of Submittal shall be signed by one of the persons so identified.
2. If a joint proposal is being submitted, identify the firms, and disclose the percentage of the work/services to be executed by each firm, based on the dollar amount of the fee proposed in the Price Proposal, so that the resident contractor preference or veteran resident contractor preference can be applied in proportion to the work done by each contractor.
3. Acknowledge acceptance of all conditions that govern the procurement. Acknowledge that the information provided in the proposal is truthful, accurate and complete, and that the firm is bound by all information, data, certifications, disclosures and attachments submitted.
4. Acknowledge that, the omission of any material fact concerning requested

information, or the submission of any material false or misleading statement, or misrepresentation of a material fact concerning any requested or submitted information, may lead to the disqualification of the proposal as 'non-responsive'.

5. Acknowledge that the Owner has a right to obtain relevant information from other sources (references) to determine that the Offeror is 'responsible'.
6. Acknowledge that if awarded the contract, the RFP documents, and all terms and conditions stated therein, and all information, data, certifications, disclosures and addendum shall be incorporated as part of the Contract.
7. Acknowledge the receipt of all addenda to this RFP and list them by number and date.
8. Provide certification and/or documentation that the firm possesses the necessary equipment, financial resources, technical resources, management, professional and craft personnel resources and other required capabilities to successfully perform the contract, or will achieve same through its prelisted subcontractors.

TAB 2 – GENERAL CONTRACTOR STATEMENT OF QUALIFICATIONS & ATTACHMENTS

Completely fill out the attached General Contractor Statement of Qualifications form and its associated attachments, providing all requested information.

NOTE: Offeror should submit only one copy of Attachment F – Firms Written Safety Plan, bound separately from the rest of the Technical Proposal.

TAB 3 – SUBCONTRACTOR QUALIFICATIONS LISTING FORM AND SUBCONTRACTOR'S STATEMENTS OF QUALIFICATIONS & ATTACHMENTS

As the first item in this section, include a copy of the exact and complete Subcontractor Qualifications Listing Form 00 4334 as it appears in Tab 3 of the original Technical Proposal.

Then, completely fill out the Subcontractor Statement of Qualifications form (see Appendix for form) and its associated attachments, providing all requested information, for each subcontractor that meets one or both of the following two criteria: The value of the subcontractors' work that meets the listing threshold stated below shall submit a Subcontractor Statement of Qualifications:

> "Subcontractor Qualification Statements. Subcontractor qualification statements shall be required for all subcontractors identified in the technical proposal where the value of the subcontract is fifty thousand ($50,000) or five percent (5%) of the estimate whichever is greater. A using agency MAY reserve the right to require subcontractor qualification statements from any other subcontractors, at whatever tier and regardless of the value of the subcontract."

1. Subcontractor Statement of Qualifications Forms shall be provided for the subcontractors performing the trades listed below, regardless of the value of the subcontract. If the Offeror is to self-perform the work, then Offeror is to complete the Forms:
    a. HVAC
    b. Electrical
    c. Plumbing

d. Fire Suppression & Fire Alarm
e. Demolition (if applicable)
f. Metal Framing
g. Acoustical
h. Insulation
i. Concrete
j. Masonry
k. Flooring
l. Carpentry
m. Interior Painting
n. Windows & Doors
o. Roofing (if applicable)
p. Solar panels (if applicable)
q. Water Catchment (if applicable)
r. Abatement

2. Provide Sub-Tabs to separate and label each Subcontractor's Statement of Qualifications.

TAB 4 – PAST PERFORMANCE

Provide the following information:

a. Past performance summary and past capability to meet schedules, meet budgets and meet project administration requirements for comparable projects.

Specifically, the last five projects you have completed for any university or institutional client in New Mexico.

1. **Was the project completed early? If yes, how was that accomplished?**
2. **Was the project completed late? If yes, how many days and why?**
3. **How many days after Substantial Completion were required to complete the punch list items?**
4. **Were you or your subcontractors called back to the job for any reason during the warranty period? After the warranty period?**
5. **Were there any outstanding issues remaining after the warranty inspection?**
6. **Did your firm refuse to do additional work requested by the owner? If yes, why?**
7. **What was your company's process for vetting the pricing from your subcontractors and suppliers on change orders in order to ensure fair pricing to the owner?**
8. **What was the dollar threshold below which your firm absorbed additional cost changes in order to avoid disproportionate administrative costs for all parties? Give examples of the changes on this project for which your firm**

absorbed the costs?

b. Describe the role of each teaming partner on the contract.

c. Evidence of past performance quality and overall customer satisfaction.

d. Record of compliance with applicable laws and regulations on past projects.

e. Past record of achievement of health and safety targets.

f. Firm's experience in delivering LEED-rated or equivalent green/sustainable buildings.

Offerors are cautioned that the Evaluation Committee will use data provided by teaming partners as well as data obtained from other sources in the evaluation of past performance.

TAB 5 – PROJECT STAFFING

Provide the following information:

a. Brief resume (education, professional certification(s), years with firm, total years of experience, and a brief description of experience supporting the proposed role) for each key project personnel.

b. Address the extent to which key personnel have worked together as a team on projects of similar or greater magnitude and on projects of the same nature. To this end, provide a matrix that lists key staff members' names across the top of the matrix and lists past projects down the side of the matrix. The project list should begin with all of the projects that appear in Item 3.a. of the General Contractor's Statement of Qualifications. The project list may also include up to five more projects that demonstrate how the key personnel have worked together as a team. At each intersection within the field of the matrix, list the role that the person filled on that particular project (such as Project Manager, Site Superintendent, Safety Manager, QA/QC Manager, Estimator, etc).

c. Describe Contractor's and subcontractors' participation in skill training.

d. Address reliable staffing sources/project staffing.

TAB 6 – MANAGEMENT PLAN

Provide the following information:

a. Management Team: provide an organization chart of the Management Team and address how critical subcontractors were selected and will be managed.

b. Describe how the construction will be organized, managed, and administered to meet the project requirements, including security and safety controls, staging areas, delivery routes, crane locations and interfaces required at the site with the using agency.

c. Describe the technical approach to project that is intended to ensure that tasks are executed within cost, schedule, and quality goals.

d. Address protocol to support optimization of sustainability principles and achievement of LEED certification.

e. Provide proposed project schedule. Indicate critical dates and other information in sufficient detail for the Evaluation Committee to determine if time frames are reasonable.

f. Description of ability to deliver the project within the construction time.

TAB 7 – HEALTH AND SAFETY

Provide the following information:

a. Provide a summary description of the General Contractor's Health and Safety management system. (One copy only of the full General Contractor's written Safety Plan is required as Attachment F of the General Contractor Statement of Qualifications).

b. Identify the competent person responsible for, and capable of, implementing the safety and health program/plan.

c. Address project specific health and safety risks that have been identified by the RFP and additional risks that the Offeror's team has identified. Describe processes to minimize risk and to ensure that health and safety issues are clearly communicated with the contractors, subs, and the owner.

TAB 8 – CAPABILITY OF FIRM

Provide a narrative (not to exceed one page) that provides evidence that the firm is capable of delivering project on time and within budget.

C. IMPORTANT NOTE ON THE TECHNICAL PROPOSAL'S CONTENTS

Regarding the apparent duplication of required information between certain Attachments of the General Contractor's Statement of Qualifications and the other sections of the Technical Proposal:

The intention of Tab's 4, 5, 6, 7 & 8 of the Technical Proposal is to provide a place for the proposer to make a concise presentation of the strengths of the proposed team in the exact categories that the committee will be scoring, unencumbered by the format of the Statement of Qualifications Forms. If the proposer so chooses, other sections of the Technical Proposal may be referenced within these Tabs, without wholly duplicating that information. Also, information presented elsewhere may be summarized or condensed within these Tab sections to make the proposer's presentation more clear.

VOLUME 2 – PRICE PROPOSAL

(Provide One Original Copy of the Following Information in a Separate Envelope. Price Proposal Form is included in Div. 00 of the Project Manual)

PRICE PROPOSAL SHALL INCLUDE THE FOLLOWING DOCUMENTS:

___Item 1 **Price Proposal Form** (including the information listed immediately below)
- ___NM State License Number & Classifications
- ___Resident Contractor (or Veteran Resident Contractor) Preference Certificate Number
- ___NM DOL (Workforce Solutions) Certificate Number
- ___Contractor's New Mexico Gross Receipts Tax Number
- ___Contractor's Federal Employee Identification Number
- ___Acknowledgment of Receipt of Addenda
- ___Base Bid Price, Alternates & Allowances
- ___Signature and Corporate Seal (if applicable)

___Item 2 **Proposal Security** (Bond or Cash), **Agent's Affidavit**

___Item 3 **Notarized Declaration Letter from Surety**

___Item 4 **Certificate of Insurance**

___Item 5 **Subcontractors Listing Form (including Subcontractor Listing Requirements and Assignment of Antitrust Claims)**

___Item 6 **Resident Contractor (or Veteran Resident Contractor) Preference Certificate**

___Item 7 **Campaign Contribution Disclosure Form**

___Item 8 **Conflict of Interest and Debarment/Suspension Certification Form**

___Item 9 **Contractor's State of NM W-9 Form**

___Item 10 **Offeror's Contractor's License(s)**

EXPLANATION OF ITEMS TO BE INCLUDED IN PRICE PROPOSAL:

ITEM 1 – PRICE PROPOSAL FORM: Fill out the "Schedule of Values" form at the end of RFP.

1. Price Proposals shall be presented in the form of a total Base Proposal using the Contractor's Costs Form at the end of the RFP plus any additive or deductive alternates selected by the Owner per Allowances (Section 01 2100) and Alternates (Section 01 2300) . A proposal must be submitted on all proposal items, allowances and alternates; segregated proposals will not be accepted.
2. The proposal, bearing original signatures, must be typed or hand-written in ink on the Price Proposal Form.
3. Proposal price shall include state gross receipts or local options taxes under its own line item. Taxes will be included in the Contracted Amount at prevailing rates as a separate item to be paid by Owner.
4. In submitting this proposal, each Offeror must satisfy all terms and conditions of the Proposal Documents. All work covered by this Request for Proposals shall be in accordance with applicable state laws and, if price proposal amount is $60,000 or more, is subject to the minimum wage rate determination issued by the office of the NM Work Force Solutions Department for this project. If the price proposal amount of the contractor or any subcontractor exceeds $60,000, the contractor and/or subcontractor must comply with the registration requirements pursuant to the NM Work

Force Solutions Department Registration Act.

5. Before submitting a proposal, each Offeror shall carefully examine the RFP; shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the proposal the cost of all items required by the RFP. If the contractor observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the contractor shall promptly notify the specified FD+C Representative and the necessary changes shall be accomplished by addendum.

ITEM 2 – PROPOSAL SECURITY (BOND OR CASH):

Offeror shall provide proposal security in the form of a surety bond executed by a surety company authorized to do business in the State of New Mexico in the amount of **5%** of the total price proposal, or the equivalent in cash by means of a cashier's check or in a form satisfactory to the Owner, which bond or check must accompany Offeror's price proposal.

No Offeror may withdraw his proposal for **5 days** after the actual date of the opening thereof.

ITEM 3 – NOTARIZED DECLARATION LETTER FROM SURETY:

The Offeror will provide, with the price proposal, a notarized declaration letter from a bonding company licensed to do business in the State of New Mexico confirming the Offeror's ability to obtain a Performance Bond, and a Labor and Materials Payment Bond in an amount not less than 100% of the price proposal.

ITEM 4 – CERTIFICATE OF INSURANCE:

Offeror shall provide a Certificate of Insurance that meets the requirements listed in Project Manual Section 00 6000 Bond and Insurance.

ITEM 5 – SUBCONTRACTOR LISTING FORM (including Subcontractor Listing Requirements and Assignment of Antitrust Claims)

Each Offeror shall complete the Subcontractor Listing Form and include this form in their proposal. The Offeror shall provide a list of all subcontractors that will perform work on the project above the threshold indicated on the List of Subcontractors. The Offeror may not change any of the firms listed without the Owner's consent.

The Owner will consider any request for a change in the listed firms in conformance with the New Mexico "Subcontractors Fair Practices Act" (New Mexico Statutes Annotated, Chapter 13, Sections §13-4-31 through §13-4-43).

ITEM 6 – ASSIGNMENT OF ANTITRUST CLAIMS FORM:

The Offeror, and the successful Offeror's subcontractors, and suppliers, at the time the Agreement between Owner and Contractor is signed, shall complete the Assignment of Antitrust Claims Form.

ITEM 7 – RESIDENT CONTRACTOR (OR VETERAN RESIDENT CONTRACTOR) PREFERENCE CERTIFICATE:

It will be the sole responsibility of any Proposer claiming a Resident Contractor Preference or Veteran Resident Contractor Preference to apply to the State of New Mexico Department of Taxation and Revenue for the proper certification and to receive approval, a certification number, and a certificate prior to the date and time for receipt of Proposals. Requests for qualification as a Resident Contractor or a Veteran Resident Contractor after receipt of Proposals will not be considered.

1. To receive a resident business preference, a business or contractor shall submit with its proposal a copy of a valid resident business certificate or valid resident contractor certificate issued by the NM Taxation and Revenue Department.
2. When a public body awards a contract using a formal request for proposals process, a resident contractor shall be awarded the equivalent of 8% percent of the total possible points to be awarded based on the resident contractor possessing a valid resident contractor certificate.
3. To receive a veteran resident contractor preference, a contractor shall submit with its bid or proposal a copy of a valid veteran resident contractor certificate issued by the NM Taxation and Revenue Department.
4. Through either an RFP process or an ITB process the qualified veteran resident contractor shall receive:
   a) 10% preference if their annual revenues are less than $6,000,000;
5. The preference is limited in any calendar year, to an aggregate of $10,000,000 in purchases by public bodies from all resident veteran businesses receiving preferences.
6. The preferences do not apply when the expenditure includes federal funds for a specific purchase.
7. In addition to the veteran resident preference certificate, the veteran resident contractor shall provide any addition documentation required to validate the percentage of preference to be awarded.
8. If there is a joint bid or joint proposal by a combination of resident veteran, resident or nonresident businesses, the preference shall be calculated in proportion to the percentage of the contract, based on the dollar amount of the goods or services provided under the contract, that will be performed by each business as specified in the joint bid or proposal.
9. An Offeror will not be awarded both a resident business preference and a resident veteran business preference. An Offeror will be granted the greater of

the two preference percentages if an Offeror would otherwise qualify for both preferences.

ITEM 8 – CAMPAIGN CONTRIBUTION DISCLOSURE FORM:

The blank form is included in an Appendix of this RFP. Pursuant to Chapter 81, Laws of 2006, any prospective contractor seeking to enter into a contract with any state agency or local public body must file this form with that state agency or local public body. This form must be filed by any prospective contractor whether or not they, their family member, or their representative has made any contributions subject to disclosure.

ITEM 9 – CONFLICT OF INTEREST AND DEBARMENT/SUSPENSION CERTIFICATION FORM:

Each Offeror shall complete this form (which is provided in the Appendix of the RFP) and include it in their proposal.

ITEM 10 – CONTRACTOR'S U.S. INTERNAL REVENUE SERVICE W-9 FORM:

Each Offeror shall complete and provide a U.S. Internal Revenue Service W-9 Form.

ITEM 11 – OFFEROR'S CONTRACTOR'S LICENSE(S)

Each Offeror shall provide a photocopy of their Contractor's License or Licenses.

V. PROPOSAL EVALUATION

A. EVALUATION PROCESS AND SCORING METHODOLOGY

1. **Receipt and Opening of Proposals**
   Proposals, and modifications to proposals, received prior to or at the submission deadline shall be time-stamped upon receipt and the Price Proposal shall be separated from the Technical Proposal and held in a secure place until the Evaluation Committee has scored the Technical Proposal. Proposals shall not be opened publicly and shall not be open to public inspection until the successful Offeror has signed a contract.

2. **Proposal Discussions**
   If mistakes are discovered after receipt of the proposal, The Evaluation Committee may request clarifications of information submitted by any or all Offerors in a written format with a specified deadline for response

   Offerors shall be accorded fair and equal treatment with respect to any clarification of proposals. If during discussions there is a need for any substantial clarification of, or change to, a Proposal, The Proposal shall be amended to incorporate such clarification or change. Any substantial oral clarification of a proposal shall be documented in writing by the short-listed Offeror.

3. **Evaluation Committee**
   The Evaluation Committee shall consist of a minimum of three (3) persons appointed by the Owner. The team shall collectively possess expertise in the technical requirements of the project, construction design and contracting. The Owner may use independent consultants or agents to support the Committee, provided appropriate precautions are taken to avoid potential conflicts of interest.

4. **Technical Proposal Evaluation**
   The Purchasing Department shall review each proposal to determine if it meets all of the mandatory requirements. Proposals that do not meet the mandatory requirements shall be considered “nonresponsive”. The Offeror shall be notified in writing of the determination. The Purchasing Department will then distribute the proposals and individual score sheets to the Evaluation Committee, and will review how the proposals shall be scored. The Evaluation Committee members shall score the technical proposals individually. The Purchasing Department will compile the points assigned to each criterion, which will then be multiplied by the possible percentage allotted to each criterion. The result of this computation is the total score for that criterion. An Evaluation Committee Meeting will be held to review ratings and for discussion of proposals and come to a consensus.

5. **Price Proposal Evaluation**
   The Price Proposal shall be initially evaluated to ensure that the price(s) offered is responsive to the RFP requirements and instructions and is realistic in respect to the project plans and specifications.

   The price basis for this RFP is the price proposed for the Base Bid. NMHU may award one or more Bid Lots and any number of Alternates at the sole discretion of NMHU, subject to availability of funds.

6. **Combining Scores, Preference Adjustments and Ranking of Proposals**
   The individual subtotals will be adjusted for Resident Contractor Preference or Veteran

Resident Contractor Preference.

Per §13-1-21 and §13-1-122 NMSA 1978 (SB 1, 2011 Special Legislative Session, effective 10/5/2011) a resident contractor who holds a valid certificate issued by the NM

Taxation and Revenue Department shall be awarded the equivalent of 8% percent of the total possible points assigned to the procurement.

A veteran resident contractor who holds a valid certificate issued by the NM Taxation and Revenue Department shall be awarded the equivalent of between zero and ten percent of the total possible points assigned to the procurement, depending on the annual revenues of the firm and the aggregate annual veteran preference awards, as described in detail in Section IV above.

When a joint proposal is submitted by a combination of resident veteran, resident or nonresident businesses, the preference shall be calculated in proportion to the percentage of the contract, (based on the dollar amount of the goods or services provided under the contract), that will be performed by each business as specified in the joint bid or proposal.

The adjusted point subtotals will be converted to a numeric ranking of all proposals per committee member. The individual member rankings per Offeror will then be totaled together to determine the overall ranking of the proposals. The Committee will then determine whether or not to conduct interviews based on the final ranking. All calculations of point standings shall occur during the Evaluation Committee meeting for this project with all members in attendance.

7. **Offeror Withdrawal from Interviews:**
A firm may withdraw their proposal if they determine that they cannot improve their position in the interview. The firm must notify NMHU of their withdrawal in writing. This event shall be documented for the procurement file, and a notice shall be sent to all Offerors of record of the event. If NMHU chooses to invite the next ranked firm to interview, their final points/rank for their Technical/Price evaluation does not change.

8. **Interviews**
Notice to finalists will include the interview date, time, and location. The purpose of the interview is to allow the Offeror to present its qualifications, past performance, management plan, schedule and general plan for constructing the project to the Board of Regents

Prior to the interviews, NMHU will issue the same set of written questions to each short-listed Offeror as a basis for evaluation. During the interviews, the written questions may lead to other questions to help clarify and better understand the firm's capabilities.

Time is of the essence for performance of the Work as required of this RFP. Offerors are expected to be available to attend the interview on the date listed in the Sequence of Selection Process Events table in Article II of this RFP or on the revised date if changed in subsequent addenda.

B. EVALUATION CRITERIA

N0.	EVALUATION	WEIGHTING (%)
1.	**Past Performance Work** NMHU will evaluate the degree to which past performance evaluations for relevant efforts included in this solicitation to reflect success. Tabs applicable to this criterion are # 2, #3, #4, #7	25
2.	**Qualifications & Experience** NMHU will evaluate the degree of your construction teams' qualifications, competencies and years of experience completing projects of similar scope and magnitude. This includes Offerors proposed solution in performance of this project as it relates to cost, schedule and price. Tabs applicable to this criterion are #1, #2, #3, #5, #6, #7, #8	25
3.	**Budgetary Experience** NMHU will evaluate the degree of your firms' budgetary experience on recent projects including but not limited to overruns and change orders. Tabs applicable to this criterion are #2, #3	25
4.	**Project Specific Budget Performance** This evaluation will include vendors demonstration of how the firm is capable to perform this project within the required budget in Las Vegas, NM. Tabs applicable to this criterion are #2, #3, #8	25

NMHU will provide the three highest ranked Offerors to the NMHU Board of Regents. The Board of Regents will conduct interviews with Offerors in open session. The Board of Regents will then direct the University to enter into contract negotiations with the selected Offeror. NMHU reserves the right to reject any and all proposals, to waive technical irregularities, and to award the contract to the Offeror whose proposal NMHU deems to be in the best interest of NMHU.

SCHEDULE OF VALUES FORM

GC BUSINESS NAME:

1.	General Conditions	$
2.	Bonds/Permits/Fees/Insurance	$
3.	LEED Costs	$
4.	SWIPP	$
5.	Site Prep	$
6.	Sanitation	$
7.	Site Work	$
8.	Site Utilities	$
9.	Footings	$
10.	Preserve & Protect (if applicable)	$
11.	Water Catchment System (If applicable)	$
12.	Landscaping (If applicable)	$
13.	Parking Lot (If applicable)	$
14.	Demo	$
15.	Hazmat	$
16.	Concrete	$
17.	Structural	$
18.	Mechanical / HVAC costs	$
19.	HVAC Controls	$
20.	Electrical costs	$
21.	Low-Voltage Cabling	$
22.	Plumbing costs	$
23.	Fire Suppression System	$
24.	Fire Alarm	$
25.	Toilet Accessories	$
26.	Metal Framing	$
27.	Acoustical	$
28.	Insulation	$
29.	Carpentry	$
30.	Tape & Texture	$
31.	Case work	$
32.	Interior Painting	$
33.	Doors & Frames	$
34.	Door Hardware	$
35.	Aluminum Storefront	$
36.	Aluminum Clad & Metal Windows	$
37.	Tile and vinyl flooring	$

38. Stairs	$
39. Interior Finishes	$
40. Directories/ Tackboards / Signage	$
41. Other Costs (be specific)	$
42. Bid Lot # 1 (outdoor shade structure)	$
43. Bid Lot # 2 (backup generator)	$
44. GC Overhead + Profit	$
45. New Mexico Gross Receipts Tax	$_____

_____

TOTAL MACC COSTS: _____

End of RFP Procurement Documents

NEW MEXICO HIGHLANDS UNIVERSITY
SININGER HALL RENOVATION

REQUEST FOR PROPOSAL FOR CONSTRUCTION #23-023

For the convenience of the contractors, an electronic version of this RFP may be issued for your use. Any changes to the document's questions or language that differs from the wording as issued in the Project Manual dated 04/04/2023 other than to fill in answers for the questions asked, will constitute a non-responsible proposal.

STATEMENT OF QUALIFICATIONS FOR GENERAL CONTRACTORS

Project Name: _____

1. OFFEROR INFORMATION

Name: _____

Address: _____

Principal Office: _____

(__) Corporation (__) Partnership (__) Sole Proprietorship (__) Joint Venture

(__) Other

_____

a. How many years has your organization been in business as a Contractor? _____

b. How many years has your organization been in business under its present business name? _____

c. Under what other or former names has your organization operated?

_____

_____

2. LICENSING

a. Name of license holder (or qualifying party) exactly as on file with the State of New Mexico Construction Industries Division:

_____

b. License Classification: _____

c. License Number: _____

d. Issue Date: _____ Expiration Date: _____

e. Is the firm's contractor's license free of ever being suspended or revoked by the CID or by the appropriate licensing agency in any other state?

(__) Yes - free of suspension or revocation (__) No – Attached explanation

f. Does your firm hold all applicable Business licenses required by State of New Mexico?

License Number: _____ Jurisdiction: _____
Fill in name of license holder, exactly as it appears on file with jurisdictional authorities:

_____
(Name)

Issue Date: _____ Expiration Date: _____

License Number: _____ Jurisdiction: _____
Fill in name of license holder, exactly as it appears on file with jurisdictional authorities:

_____
(Name)

Issue Date: _____ Expiration Date: _____

License Number: _____ Jurisdiction: _____
Fill in name of license holder, exactly as it appears on file with jurisdictional authorities:

_____
(Name)

Issue Date: _____ Expiration Date: _____

g. Is your firm free from formal debarment from public works, federal, state or local public works jurisdictions?

(__) Yes (__) No (Attach explanation)

3. EXPERIENCE

a. Has your firm completed one (1) or more educational facility, addition and/or renovation project(s) of similar complexity totaling **15,000 square feet or more since 2015**, as the proposed project? Complete **Attachment A** for five (5) maximum projects listed:

(__) Yes Number of Projects: _____ (__) No

Project 1 Name: _____

Project 2 Name:_____

Project 3 Name:_____

Project 4 Name:_____

Project 5 Name:_____

b. State the average annual amount of construction work performed during the past five years: $_____

c. Also, on **Attachment A**, list major construction project your organization has in progress, giving the name of the project, owner, architect, contract amount, percent of completion, and scheduled completion date.

d. List the categories of work that your organization normally performs with its own forces.

4. KEY PERSONNEL EXPERIENCE

Please note that more consideration will be given to those meeting or exceeding the required qualifications below:

a. Does your assigned Project Manager have the following minimum qualifications and experience? (Attach Resume at **Attachment B**)

(1) At least ten (10) years experience in the construction industry?

(__) Yes Number of Years: _____ (__) No

(2) Experience on at least one (1) construction type as identified in 3. EXPERIENCE item a

(__) Yes Number of Projects _____ (__) No

(3) Experience as a Project Manager on one (1) or more construction projects totaling **15,000 square feet or more**?

(__) Yes Number of Projects _____ (__) No

b. Does your assigned Project Foreman/Superintendent have the following minimum qualifications and experience? (Attach Resume at **Attachment B**)

(1) At least ten (10) years experience in the construction industry?

(__) Yes Number of Years: _____ (__) No

(2) Experience on at least one (1) construction type as identified in 3a.?

(__) Yes Number of Projects _____ (__) No

(3) Experience as a Project Foreman/Superintendent on one (1) or more construction projects
totaling 15,000 square feet or more?

(__) Yes Number of Projects _____ (__) No

c. Does your Safety Program Manager have the following minimum qualifications and experience? (Attach Resume to **Attachment B**)

At least five (5) years experience in a safety management role?

(__) Yes Number of Years: _____ (__) No

(2) Experience on at least one (1) construction type as identified in 3a.?

(__) Yes Number of Projects _____ (__) No

d. Does your Quality Assurance/Quality Control (QA/QC) Manager have the following minimum qualifications and experience? (Attach Resume to **Attachment B**)

(1) At least five (5) years experience in a safety management role?

(__) Yes Number of Years: _____ (__) No

(2) Experience on at least one (1) construction type as identified in 3a.?

(__) Yes Number of Projects _____ (__) No
_____ Years with your firm: _____

Present Position/Job Title: _____ Years in position: _____

List other project(s) this person has had a similar role for the past five (5) years:

_____

_____

_____

Is your QA/QC a Principal or Officer of the firm? (__) Yes (__) No

e. Please include an Organizational Chart (**Attachment C**) of the Management Team that will be assigned to this project. Identify relationships, duties and responsibilities and key roles of each individual.

5. CAPACITY AND CAPABILITY TO PERFORM THE WORK

a. Resources: Total number of current employees:

Project Managers	_____
Estimators	_____
Superintendents	_____
Foremen	_____
Tradesmen	_____
Administration	_____
Other	_____

b. Does your firm have the immediate capacity to perform the work required for this project:
(__) Yes (__) No

c. Please list all projects currently under contract totaling over 15,000 square feet with scheduled completion dates (**Attachment D**)

(__) See Attachment D (__) None

6. SURETY

a. Firm's current surety company:

_____

Will this surety be used for the construction contract for this project:?

(__) Yes (__) No (attach explanation)

Contact Agent Name: _____ Telephone: _____

Years utilizing this surety: _____ Maximum Capacity: _____

Aggregate Total of current surety in force: _____

b. Is the surety company to be used on this project licensed to do business in the State of New Mexico?

(__) Yes (__) No (attach explanation)

a. Is your firm free of having any construction contracts taken over by a surety for completion in the past five (5) years?

(__) Yes (__) No (attach explanation)

c. Has your firm used other surety companies since 2001? (__) Yes (list) (__) No

_____ _____
Surety Company Contact

_____ _____
Surety Company Contact

_____ _____
Surety Company Contact

d. Is your firm able to obtain bonding in the amount required for the completion of this project? Provide a notarized declaration from the surety identified above, stating the amount of bonding capacity available to your firm for this project at **Attachment E**.

(__) Yes (__) No (attach explanation)

7. SAFETY

a. Does your firm have a written safety program compliant with current State regulations? Provide one (1) copy of your firm's written safety program at **Attachment F**.

(__) Yes (__) No (attach explanation)

b. Provide a list of key safety personnel, including the designated safety manager who will be assigned to this project, and list specific duties.

Name and Title	Specific Duties
_____	_____
_____	_____
_____	_____
_____	_____

Name and Title	Specific Duties
_____	_____
_____	_____
_____	_____
_____	_____

Name and Title	Specific Duties
_____	_____
_____	_____
_____	_____
_____	_____

Name and Title	Specific Duties
_____	_____
_____	_____
_____	_____
_____	_____

c. Provide the Experience Modification Rate for the past five (5) years:

_____ /_____ /_____ /_____ /_____ /

d. Provide the Recordable Incident Rate for the past calendar year: _____

e. Is your firm free of committing serious or willful violations of federal or state safety laws as determined by a final non-appealable decision of a court or government agency?

(__) Yes (__) No (attach explanation)

8. INSURANCE & CLAIMS HISTORY

a. Is your firm free of any court judgments, pending litigation, arbitration and final agency decisions filed within the last five (5) years in a construction related matter in which the contractor, or any officer, is or was a party?

(__) Yes (__) No (attach explanation)

b. Has your firm during the past five (5) years been free of a determination by a court of competent jurisdiction that is filed a false claim with any federal, state or local government entity?

(__) Yes (__) No (attach explanation)

c. Does your firm have the ability to provide the required insurance in the limit stated in the project documents (General Liability and Comprehensive Auto at $1 Million per occurrence and $1 Million in the aggregate?

(__) Yes (__) No (attach explanation)

d. Please provide a notarized declaration from an insurance carrier stating that the firm is able

to obtain insurance in the limits stated as **Attachment G**.

9. QUALITY ASSURANCE – ATTACHMENT H

a. Does your firm have a written Quality Assurance Program?

(__) Yes (__) No

b. Provide one (1) copy of the written Assurance Program for **Attachment H**

10. PROJECT SCHEDULING

a. Does your firm use computerized scheduling? (__) Yes (__) No

b. If YES, which programs and versions are used? Please list:

_____

_____

_____

c. Has the firm been involved with a construction project within the past five (5) years, where the schedule was not met? (__) Yes (__) No

d. If YES, please indicate the project (refer to **Attachment A**)

i. Project: _____

Reason for Delay: _____

ii. Project: _____

Reason for Delay: _____

iii. Project: _____

Reason for Delay: _____

e. Has the firm been assessed liquidated damages due to scheduling for any project in the past five (5) years? (Refer to **Attachment A**) (__) Yes (__) No

If YES, please list projects

(1) Project: _____ Amount $_____

Reason for assessment_____

(2) Project: _____ Amount $_____

Reason for assessment_____

(3) Project: _____ Amount $_____

Reason for assessment_____

11. LABOR CODE VIOLATIONS

a. Has your firm during the past five (5) years, been free of any determinations by a court or an administrative agency of repeated or willful violations of laws and/or regulations pertaining to the payment of prevailing wages or employment of apprentices of public works projects? Refer to **Attachment I**

(__) Yes (__) No

b. Is the firm free of all Subcontractor Fair Practices Act violations for the past five (5) years?

(__) Yes (__) No

(explain)

12. JUDGEMENTS, BREACH OF CONTRACT, PROTESTS, MEDIATIONS AND ARBITRATIONS

1. List any judgments against the firm during the past 5 years; use **Attachment J**
2. List any breach of contract other than for cause
3. If applicable, list any formal bid protests and the outcome, whether denied or upheld
4. List all mediations/arbitrations in the last 5 years. Who initiated? What was the outcome?

THE UNDERSIGNED CERTIFIES THAT ALL OF THE QUALIFICATION INFORMATION SUBMITTED WITH THIS FORM IS TRUE AND CORRECT.

Name and Title	Firm Name
Signature	Address of Firm
E-mail Address	City/State/Zip
Telephone Number	Fax Number

End of GENERAL CONTRACTOR STATEMENT OF QUALIFICATIONS

ATTACHMENT A

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 3.a. EXPERIENCE

COMPLETE ONE FORM FOR EACH PROJECT LISTED (MAXIMUM 5)

PROJECT DESCRIPTION

Project Type: _____ Contact Name: _____

Project Name: _____ Contact Title: _____

Owner: _____ Contact Phone No.: _____

DESIGN PROFESSIONAL

Name of Firm: _____ Contact Name: _____

Contact Phone No.: _____ Contact Title: _____

Gross Building Area (Sq. Ft.) _____ (__) New (__) Addition (__) Renovation

Project Start Date: _____ Completion Date: _____

Original Contract Amt.: $_____ Original No. of Days to Complete: _____

Final Contract Amount
With all Change Orders: $_____

Final Contract Days to Complete:
with all Time Extensions: _____

PROJECT EXECUTION

Were Liquidated Damages assessed on this Project? (__) No (__) Yes Days ____ $ _____

Percentage of Work Subcontracted: _____%

Contract Type (__) Competitive Bid Lump Sum
(__) Negotiated Lump Sum
(__) Guaranteed Maximum Price
(__) Other (Describe)
_____

Major Subcontractors:

Mechanical: _____
Electrical: _____
Plumbing: _____
Roofing: _____

CUSTOMER SATISFACTION

How was this measured? (__) Customer Survey (__) Attached (__) Yes (__) No (__) Other (Describe)

ATTACHMENT B

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 4 a, b, c, d Resumes

ATTACH ONE (1) PAGE RESUMES OF THE PROPOSED
PROJECT MANAGER
PROJECT SUPERINTENDENT
SAFETY PROGRAM MANAGER
OTHER KEY PERSONNEL (OPTIONAL)

1. EDUCATION
   High School, College, Trade Schools, Trade Seminars, Trade/Management Specialized Courses, Etc.

2. RELATED EXPERIENCE
   Related experience should include the following:
   a. Position Title
   b. Duties and Responsibilities
   c. Major accomplishments
   d. Number of personnel supervised

3. PROJECT EXPERIENCE
   Identify project experience requested in the Statement at 4.a. (2) (3), 4.b. (2) (3), and 4.c. (2). Include the project Title and Location.

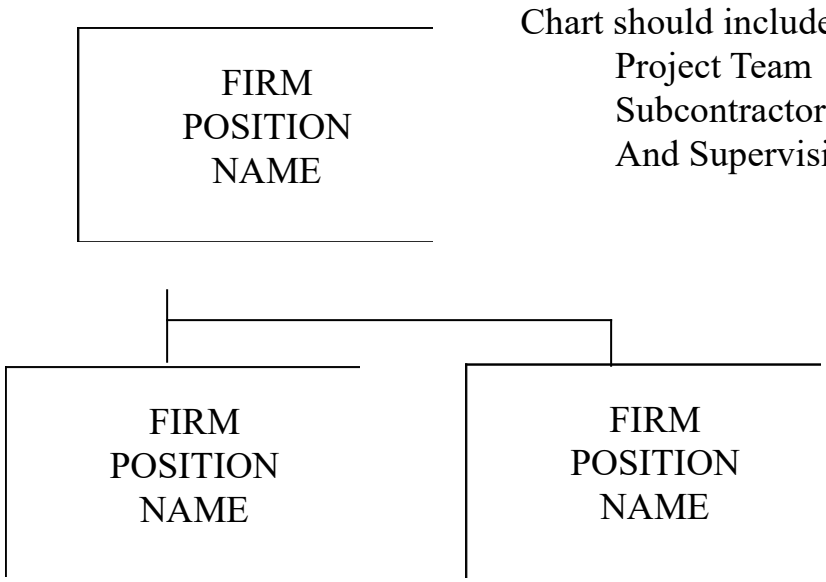
4. Other information that demonstrates the individual's strengths for this project.

5. Project Professionals and Project Owner Reference may be included.

ATTACHMENT C

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 4.e. Organizational Chart of Project Management Team



1. Indicate the relationship between PM/Supt. Of the Subcontractors and the General Contractor's PM/SUPT.

2. Indicate the relationship of the Safety Manager of the Subcontractors and General Contractor, and the relationship of the Safety Manager with others on the job site.

3. Indicate the relationship between the QA/QC Manager with other personnel on the job site.

ATTACHMENT D

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 5.c. Projects Currently Under Contract

PROJECT TITLE AND LOCATION	START DATE	PROJECTED COMPLETION

ATTACHMENT E

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 6.d. Notarized Declaration of Surety

DOCUMENTATION FROM SURETY

ATTACHMENT F

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 7.a. Copy of Firm's Written Safety Plan

SUBMIT ONLY ONE (1) COPY OF SAFETY PLAN WITH SUBMITTAL PACKET

Include Work Loss Incidents and History

ATTACHMENT G

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 8.d. Letter from Insurance Carrier

DOCUMENTATION OF INSURABILITY

ATTACHMENT H

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 9.b. Written Quality Assurance Program

SUBMIT ONLY ONE (1) COPY WITH SUBMITTAL PACKET

ATTACHMENT I

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 11.a. Affidavit of Non-violation of Labor codes

Name of Firm:

Address:

Project Reference: (Name of Owner & Project)Request for Proposal #_____

Affidavit of Non-violation of Labor Codes

To:

The undersigned officer of _____ hereby states that _____ has, during the past five (5) years, been free of any determinations by a court or an administrative agency, of repeated or willful violations of laws and/or regulations pertaining to the payment of prevailing wages or employment of apprentices of public works projects.

_____
Name

_____
Title

_____
Signature

NOTARY

State of _____

County of _____

Signed or attested before me on _____ by _____

Seal _____

My Commission Expires: _____

ATTACHMENT J

GENERAL CONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 12.a.b.c. Judgments, Breach of Contract, Protests

A. **List any judgments against the firm during the past 5 years.**

B. **List any breach of contract other than for cause.**

C. **If applicable, list any formal bid protests and the outcome, whether denied or upheld.**

D. **List all mediations/arbitrations in the last 5 years. Who initiated? What was the outcome?**

NEW MEXICO HIGHLANDS UNIVERSITY
SININGER HALL RENOVATION
REQUEST FOR PROPOSAL FOR CONSTRUCTION #23-023

For the convenience of the contractors, an electronic version of this RFP is issued for your use. Any changes to the document's questions or language that differs from the wording as issued in the Project Manual dated 04/04/2023 other than to fill in answers for the questions asked, will constitute a non-responsible proposal.

STATEMENT OF QUALIFICATIONS FOR SUBCONTRACTORS

Project Name: _____

1. OFFEROR INFORMATION

Firm Name:

_____

Type of Firm:

(__) Corporation (__) Partnership (__) Sole Proprietorship (__) Joint Venture

(__) Other

_____

a. Year Firm was established: _____

b. Parent Company (if applicable) _____

c. All former names during the past 10 years your organization has operated?

_____

_____

2. LICENSING

Provide your team's New Mexico contractor's license, which is current and in good standing with the State of New Mexico Construction Industries Division (CID).

a. Name of license holder (or qualifying party) exactly as on file with the State of New Mexico Construction Industries Division:

_____

b. License Classification: _____

c. License Number: _____

d. Issue Date: _____ Expiration Date:_____

e. Is the firm's contractor's license free of ever being suspended or revoked by the CID or by the appropriate licensing agency in any other state?

(__) Yes - free of suspension or revocation (__) No – Attach explanation

3. EXPERIENCE

a. Has your firm completed one (1) or more commercial buildings of similar complexity and of 10,000 square feet or more since 2015, as the proposed project? Complete Attachment A for three (3) maximum projects listed:

(__) Yes Number of Projects: _____ (__) No

Project 1 Name: _____

Project 2 Name: _____

Project 3 Name: _____

Provide copies of Performance Evaluation Reports prepared in connection with projects described in Para. 3.a above.

b. State the average annual amount of construction work performed during the past five years: $_____

c. Also, on Attachment A, list major construction project your organization has in progress, giving the name of the project, owner, architect, contract amount, percent of completion, and scheduled completion date.

4. KEY PERSONNEL EXPERIENCE

Please note that more consideration will be given to those meeting or exceeding the required qualifications below:

a. Does your assigned Project Manager have the following minimum qualifications and

experience? (Attach Resume at **Attachment B**)

(1) At least ten (10) years experience in the construction industry?

(__) Yes Number of Years: _____ (__) No

(2) Experience on at least one (1) construction type as identified in 3a.?

(__) Yes Number of Projects _____ (__) No

(3) Experience as a Project Manager on one (1) or more construction projects totaling 15,000 square feet or more?

(__) Yes Number of Projects _____ (__) No

b. Does your assigned Project Foreman/Superintendent have the following minimum qualifications and experience? (Attach Resume at **Attachment B**)

(1) At least ten (10) years experience in the construction industry?

(__) Yes Number of Years: _____ (__) No

(2) Experience on at least one (1) construction type as identified in 3a.?

(__) Yes Number of Projects _____ (__) No

(3) Experience as a Project Foreman/Superintendent on one (1) or more construction projects totaling 10,000 square feet or more?

(__) Yes Number of Projects _____ (__) No

c. Does your Firm have a Quality Assurance/Quality Control (QA/QC) Manager?:

(__) Yes (__) No

Name:_____ Years with your firm: _____

Present Position/Job Title: _____ Years in position: _____

List other project(s) this person has had a similar role for the past five (5) years:

_____

_____

Is your QA/QC a Principal or Officer of the firm? (__) Yes (__) No

5. CAPACITY AND CAPABILITY TO PERFORM THE WORK

a. Resources

Total number of current employees:

Project Managers _____

Estimator's _____

Foremen _____

Tradesmen _____

Administration _____

Other _____

b. Please list all projects currently under contract at square footage listed in 3a. with scheduled completion dates (**Attachment C**)

(__) See Attachment C (__) None

6. SAFETY

a. Does your firm have a written safety program compliant with current State regulations? Provide one (1) copy of your firm's written safety program at **Attachment D**.

(__) Yes (__) No (attach explanation)

b. Provide your Experience Modification Rate for the past five (5) years:

_____ /_____ /_____ /_____ /_____ /

c. Provide the Recordable Incident Rate for the past calendar year: _____

d. Is your firm free of committing serious or willful violations of federal or state safety laws Is determined by a final non-appealable decision of a court or government agency?

(__) Yes (__) No (attach explanation)

7. INSURANCE & CLAIMS HISTORY

1. Is your firm free of any court judgments, pending litigation, arbitration and final agency decisions filed within the last five (5) years in a construction related matter in which the contractor, or any officer, is or was a party?

(__) Yes (__) No (attach explanation)

2. Has your firm during the past five (5) years been free of a determination by a court of competent jurisdiction that is filed a false claim with any federal, state or local government entity?

(__) Yes (__) No (attach explanation)

3. Does your firm have the ability to provide the required insurance in the limit stated in the project documents (General Liability and Comprehensive Auto at $1 Million per occurrence and $1 Million in the aggregate?

(__) Yes (__) No (attach explanation)

8. QUALITY ASSURANCE

a. Does your firm have a written Quality Assurance Program?

(__) Yes (__) No

b. Note: If you have a Quality Assurance Program, please provide one (1) copy of the written Assurance Program for **Attachment E**

9. LABOR CODE VIOLATIONS

a. Has your firm during the past five (5) years, been free of any determinations by a court or an administrative agency of repeated or willful violations of laws and/or regulations pertaining to the payment of prevailing wages or employment of apprentices of public works projects? Refer to **Attachment F**

(__) Yes (__) No

b. Is the firm free of all Subcontractor Fair Practices Act violations for the past five (5) years?

(__) Yes (__) No (explain)

THE UNDERSIGNED CERTIFIES THAT ALL OF THE QUALIFICATION INFORMATION SUBMITTED WITH THIS FORM IS TRUE AND CORRECT.

Name and Title	Firm Name
Signature	Address of Firm
E-mail Address	City/State/Zip
Telephone Number	Fax Number

End of SUBCONTRACTOR STATEMENT OF QUALIFICATIONS

ATTACHMENT B

SUBCONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 4 a, b, c, d Resumes

ATTACH ONE (1) PAGE RESUMES OF THE PROPOSED

1. PROJECT MANAGER
2. PROJECT FOREMAN/SUPERINTENDENT
3. OTHER KEY PERSONNEL (OPTIONAL)

1. EDUCATION
   High School, College, Trade Schools, Trade Seminars, Trade/Management Specialized Courses, Etc.

2. RELATED EXPERIENCE
   Related experience should include the following:
   (a) Position Title
   (b) Duties and Responsibilities
   (c) Major accomplishments
   (d) Number of personnel supervised

3. PROJECT EXPERIENCE
   Identify project experience requested in the Statement at 4.a. (2) (3), 4.b. (2) (3), and 4.c. (2). Include the project Title and Location.

4. Other information that demonstrates the individual's strengths for this project.

5. Project Professionals and Project Owner Reference may be included.

COMBINED
LIST OF SUBCONTRACTORS
and
ASSIGNMENT OF ANTITRUST CLAIMS
by
CONTRACTOR, SUBCONTRACTORS,
SUBSUBCONTRACTORS, and SUPPLIERS

EXAMPLE TRADES AND SUPPLIERS: SITE WORK, CONCRETE, MASONRY, FRAMING, LUMBER, STEEL, STEEL FABRICATION, ROOFING, EXTERIOR INSULATION AND FINISH, DRYWALL, DOORS, GLASS AND GLAZING, PLASTER, PAINTING, CARPET, RESILIENT, CONVEYING SYSTEMS, HVAC, CONTROLS, PLUMBING, SHEET METAL, ELECTRICAL

1. Subcontractor Listing shall be included with Cost Proposal as a condition of the Proposal and be fully complete with regards to all Subcontractors providing services valued at $5,000.00 or more, or one-half of one percent of the architect's or engineer's estimate of the total project cost, not including alternates, whichever is greater pursuant to Section 13-4-34, NMSA 1978.

Listing Threshold for this Project: __$33,500.00__

a. Subcontractor Listing shall be expanded after Proposal award, and before Contract, to include major Suppliers and, each entity listed shall be signed by individual empowered to obligate Supplier, Subcontractor, or Subsubcontractor.

b. Subcontractor Listing shall also be expanded after Proposal award by apparent low Offeror if Awarded, and before Contract, to include the Department of Workforce Solutions labor enforcement fund registration number. See the Department of Workforce Solutions web site at www.dws.state.nm.us under "Public Works" for registration form, listings and information.

2. PROJECT NAME: **Sininger Hall Renovation**
REQUEST FOR PROPOSAL NUMBER: 23-023

The undersigned agrees that any and all claims which the firm may have or may inure to it for overcharges resulting from antitrust violations as to goods, services, and materials purchased in connection with the above-referenced project are hereby assigned to the Owner, but only to the extent that such overcharges are passed on to the Owner. It is agreed that the firm retains all rights to any such antitrust claims to the extent of any overcharges not passed on to NMHU, including the right to any treble damages attributable thereto.

Subcontractor Listing

and Assignment of Anti-Trust Claims

*Signature required Upon Notice of Intent to Award

TYPE OF WORK	ENTITY NAME	CITY & STATE	Labor Enforcement Fund Registration # (if over $60,000)	SIGNATURE *
SITE WORK				
CONCRETE				
MASONRY				
FRAMING				
STEEL ERECTION				
ROOFING				
INSULATION				
DRYWALL				
GLAZING				
PLASTER				
FLOORING				
PAINTING				
FURNISHINGS				
ELEVATOR				
HVAC				
CONTROLS				
PLUMBING				
ELECTRICAL				

TYPE OF WORK	ENTITY NAME	CITY & STATE	Labor Enforcement Fund Registration # (if over $60,000)	SIGNATURE *

Date of Proposal: _____

New Mexico State Contractor's License No. _____

License Classifications: _____

Resident Contractor's Preference Certificate No. _____

Veteran Resident Contractor Preference Certificate No. _____
Percent of preference qualified for: _____(10% / 8% / 7%).

NOTE: Attach a copy of the valid certificate and documentation to validate percent preference.

NM DOL (Workforce Solutions) Certificate No. _____

Contractor's New Mexico Gross Receipts Tax No._____

Contractor's Federal Employee Identification No._____

Project Name: Sininger Hall Renovation

Proposal of (company name): _____
(Hereinafter called the "Offeror") organized and existing under the laws of the State of New Mexico, doing business as a Corporation, Partnership or Individual. (Circle correct one).

To: New Mexico Highlands University (hereinafter called "NMHU") for:
The renovation of Sininger Hall

The undersigned, as an authorized representative for the Offeror named above, in compliance with the Request for Proposals for the construction of the Sininger Hall Renovation, having examined the drawings and specifications, with related documents, and having examined the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of labor, materials and supplies, hereby proposes to furnish all labor, materials and supplies, and to construct the project in accordance with the contract documents at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the contract documents, of which this proposal is a part.

The undersigned Offeror's representative also acknowledges receipt of the following Addenda:

Addendum No: ___, dated _____, Addendum No: ___, dated_____

Addendum No: ___, dated _____, Addendum No: ___, dated_____

Addendum No: ___, dated _____, Addendum No: ___, dated_____

Addendum No: ___, dated _____, Addendum No: ___, dated_____

The following information is required for state reporting purposes only, and will not be used in evaluating or awarding the contract. Is project material offered grown, produced or wholly manufactured in New Mexico? _____ (Yes/No) (Percentage; reference V-B-5 of the RFP)

BASE PRICE: The Offeror agrees to perform all work for the construction of the Sininger Hall Renovation, as described in the Project Manual and as shown on the Drawings for the following Base Price amount.

(Amounts to be shown in both words and figures. In case of a discrepancy, the amount shown in words will govern, **please print**.) **All sums will exclude NM Gross Receipts Tax**.

The Work to be performed under this Contract shall be commenced not later than ten (10) consecutive days after the date of written Notice to Proceed, and that Substantial Completion shall be achieved not later than 330 calendar days after the date of written Notice to Proceed, except as hereafter extended by valid written Change Order by the Owner, for Base Price.

Should the Contractor neglect, refuse, or otherwise fail to complete the Work within the time specified, the Contractor agrees to pay to the Owner in partial consideration for the award of this Contract the amount of One Thousand Dollars ($1000) per consecutive day, not as a penalty, but as liquidated damages for such breach of the Contract.

The price basis for this RFP is the price proposed for the Base Price, subject to the availability of funds. NMHU may award one or more Bit Lots at the sole discretion of NMHU, subject to availability of funds. Refer to Bid Lot Schedule on Drawings for detailed breakdown.

BASE PRICE:

Base Bid

Total Base Price Lump Sum: _____
_____Dollars, ($_____)

Bid Lot #1 – Outdoor Shade Structure and Associated Work

Total Price Lump Sum: _____
_____Dollars, ($_____)

_____)

Bid Lot #2 – Back-up Generator

Total Price Lump Sum: _____
_____Dollars, ($_____)

_____)

The Offeror understands that the contract will be awarded in accordance with the provisions of the Request for Proposals and that the Owner reserves the right to reject any or all proposals and to waive any technical irregularities.

The Offeror agrees that this price will be good and may not be withdrawn for a period of forty-five (45) calendar days after the scheduled closing time for receiving price proposals.

Upon receipt of written notice of acceptance of this Price, Offeror will execute the final contract and deliver surety bonds as required by the Request for Proposals within seven calendar days. The PROPOSAL SECURITY attached in the sum of 5% of the amount proposed is: _____

_____

_____Dollars, ($_____)

And will become the property of the Owner in the event the contract and bonds are not executed within the time set forth herein, as liquidated damages for the delay and additional expenses to the Owner caused thereby.

Respectfully Submitted,

By: (Authorized Signature) _____Date: _____

By: (Same Name, Printed or Typed) _____

Title: _____

Company: _____

Address: _____ Phone: _____

_____Zip: _____

Fax: _____ Email: _____

(Affix Corporate Seal if proposal is by Corporation)

BOND REVIEW AND APPROVAL FORM

THIS FORM MUST BE ATTACHED TO BOND

REVIEW AND APPROVAL:

This Bond has been executed by a Surety named in the current list of "companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies," as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, United States Treasury Department.

APPROVED:

_____ Date: _____

Owner's Representative or Governing Authority

AGENT'S AFFIDAVIT

THIS FORM MUST BE USED BY SURETY

(To be filled in by Agent.)

STATE OF_____

COUNTY OF_____

_____, being first duly sworn, deposes and says that he/she is the duly appointed agent for _____ and is licensed in the State of New Mexico.

Deponent further states that a certain bond given to indemnify the State of New Mexico in connection with the construction of _____ dated the_____day of _____, 2023 executed by_____ _____ Contractor, as principal, and, _____ _____as surety, signed by this Deponent; and Deponent further states that said bond was written, signed, and delivered by him/her; that the premium on the same has been or will be collected by him/her; and that the full commission thereon has been or will be retained by him/her.

Subscribed and sworn to before me this _____day of _____, 2023,

_____

Notary Public

My Commission expires: _____

AGENT'S ADDRESS:

_____

_____

Telephone:_____

CAMPAIGN CONTRIBUTION DISCLOSURE FORM

Pursuant to Chapter 81, Laws of 2006, any prospective contractor seeking to enter into a contract with any state agency or local public body must file this form with that state agency or local public body. The prospective contractor must disclose whether they, a family member or a representative of the prospective contractor has made a campaign contribution to an applicable public official of the state or a local public body during the two years prior to the date on which the contractor submits a proposal or, in the case of a sole source or small purchase contract, the two years prior to the date the contractor signs the contract, if the aggregate total of contributions given by the prospective contractor, a family member or a representative of the prospective contractor to the public official exceeds two hundred and fifty dollars ($250) over the two year period.

THIS FORM MUST BE FILED BY ANY PROSPECTIVE CONTRACTOR WHETHER OR NOT THEY, THEIR FAMILY MEMBER, OR THEIR REPRESENTATIVE HAS MADE ANY CONTRIBUTIONS SUBJECT TO DISCLOSURE.

The following definitions apply:

"**Applicable public official**" means a person elected to an office or a person appointed to complete a term of an elected office, who has the authority to award or influence the award of the contract for which the prospective contractor is submitting a competitive sealed proposal or who has the authority to negotiate a sole source or small purchase contract that may be awarded without submission of a sealed competitive proposal.

"**Campaign Contribution**" means a gift, subscription, loan, advance or deposit of money or other thing of value, including the estimated value of an in-kind contribution, that is made to or received by an applicable public official or any person authorized to raise, collect or expend contributions on that official's behalf for the purpose of electing the official to either statewide or local office. "Campaign Contribution" includes the payment of a debt incurred in an election campaign, but does not include the value of services provided without compensation or unreimbursed travel or other personal expenses of individuals who volunteer a portion or all of their time on behalf of a candidate or political committee, nor does it include the administrative or solicitation expenses of a political committee that are paid by an organization that sponsors the committee.

"**Contract**" means any agreement for the procurement of items of tangible personal property, services, professional services, or construction.

"**Family member**" means spouse, father, mother, child, father-in-law, mother-in-law, daughter-in-law or son-in-law.

"**Pendency of the procurement process**" means the time period commencing with the public notice of the request for proposals and ending with the award of the contract or the cancellation of the request for proposals.

"**Person**" means any corporation, partnership, individual, joint venture, association or any other private legal entity.

"**Prospective contractor**" means a person who is subject to the competitive sealed proposal process set forth in the Procurement Code or is not required to submit a competitive sealed proposal because that person qualifies for a sole source or a small purchase contract.

"**Representative of a prospective contractor**" means an officer or director of a corporation, a member or manager of a limited liability corporation, a partner of a partnership or a trustee of a trust of the prospective contractor.

DISCLOSURE OF CONTRIBUTIONS:

Contribution Made By: _____

Relation to Prospective Contractor: _____

Name of Applicable Public Official: _____

Date Contribution(s) Made: _____

Amount(s) of Contribution(s) _____

Nature of Contribution(s) _____

Purpose of Contribution(s) _____

(The above fields are unlimited in size)

_____ _____
Signature Date

_____
Title (position)

—OR—

NO CONTRIBUTIONS IN THE AGGREGATE TOTAL OVER TWO HUNDRED FIFTY DOLLARS ($250) WERE MADE to an applicable public official by me, a family member or representative.

_____ _____
Signature Date

_____
Title (Position)

CONFLICT OF INTEREST AND
DEBARMENT/SUSPENSION CERTIFICATION FORM
SININGER HALL
RFP 23-002

CONFLICT OF INTEREST

As utilized herein, the term "Vendor" shall mean that entity submitting a proposal to New Mexico Highlands University in response to the above referenced request for proposals.

The authorized Person, Firm and/or Corporation states that to the best of his/her belief and knowledge: No employee or board member of New Mexico Highlands University (or close relative), with the exception of the person(s) identified below, has a direct or indirect financial interest in the Vendor or in the proposed transaction. Vendor neither employs, nor is negotiating to employ, any New Mexico Highlands University employee, board member or close relative, with the exception of the person(s) identified below. Vendor did not participate, directly or indirectly, in the preparation of specifications upon which the quote or offer is made. If the Vendor is a New Mexico State Legislator or if a New Mexico State Legislator holds a controlling interest in Vendor, please identify the legislator: _____ List below the name(s) of any New Mexico Highlands University employee, board member or close relative who now or within the preceding 12 months (1) works for the Vendor; (2) has an ownership interest in the Vendor (other than as an owner of less than 1% of Vendor's stock, if Vendor is a publicly traded corporation); (3) is a partner, officer, director, trustee or consultant to the Vendor; (4) has received grant, travel, honoraria or other similar support from Vendor; or (5) has a right to receive royalties from the vendor.

_____

_____

_____

DEBARMENT/SUSPENSION STATUS

The Vendor certifies that it is not suspended, debarred or ineligible from entering into contracts with the Federal Government, or any State agency or local public body, or in receipt of a notice or proposed debarment from any Federal or State agency or local public body. The vendor agrees to provide immediate notice to New Mexico Highlands University's Purchasing Department in the event of being suspended, debarred or declared ineligible by any department or agency of the Federal government, or any agency of local public body of the State of New Mexico, or upon receipt of a notice of proposed debarment that is received after the submission of the quote or offer but prior to the award of the purchase order or contract.

CERTIFICATION

The undersigned hereby certifies that he/she has read the above CONFLICT OF INTEREST and DEBARMENT/SUSPENSION Status requirements and that he/she understands and will comply with these requirements. The undersigned further certifies that they have the authority to certify compliance for the vendor named **and that the information contained in this document is true and accurate to the best of their knowledge.**

Signature:

Name of Person Signing (typed or printed):

Title:

Date:

Name of Company (typed or printed):

Address:

City/State/Zip:

Telephone No:

Fax No.:

Email Address:

LISTING FORM 00 4334

For Submission of

SUBCONTRACTOR
QUALIFICATIONS QUESTIONNAIRE

THRESHOLD: $50,000 OR 5% OF ESTIMATE WHICHEVER IS GREATER

DP/AE ESTIMATE OF TOTAL PROJECT COST: $ 6,700,000

QUALIFICATION THRESHOLD FOR THIS PROJECT: $ 335,000

1. The using agency has the right and requires that the contractor provide subcontractor qualifications from the subcontractors listed below, at whatever tier and regardless of the value of the subcontract.
2. Subcontractor qualification questionnaires shall be required for all subcontractors identified in the Technical Proposal pursuant to the subcontractor listing requirements, where the value of the subcontract is fifty thousand ($50,000) or five percent (5%) of the estimate, whichever is greater.

   This Subcontractor Questionnaire Listing Form shall be included in the Technical Proposal, in **TAB 3.**

   Note: This form must be completed and submitted by the deadline for proposal submission. The offeror has the option to submit the original and required copies of the Subcontractor Qualifications Questionnaires up to 24 hours after the date and time of the proposal submission.

SUBCONTRACTOR	ENTITY NAME
HVAC	
Electrical	
Concrete	
Plumbing	
Masonry	
Windows	
Flooring	
Carpentry	

SUPPLEMENTAL INFORMATION

ASBESTOS CONSIDERATIONS

The Contractor, Subcontractors, and Materials Suppliers will to the best of their abilities provide and install materials that are ASBESTOS-FREE. Any material violating AHERA regulations must be removed by a licensed asbestos abatement Contractor and replaced with non-asbestos containing equal(s) at no cost to Owner. The area where such work is conducted will be returned to its substantially complete condition. Such replacement action will be in effect for the period of construction and continue through the entire warranty year.

ENUMERATION OF THE CONTRACT DOCUMENTS

PROJECT: Sininger Hall Renovation

The Contract Documents will consist of the Agreement between the Owner and the Contractor and General Conditions, plus all attachments, exhibits, project specifications, schedules, the construction drawings, the Project Manual, the Request for Proposal (including the RFP Legal Notice and all Attachments), the Price Proposal Form and Proposal Bond Form, the Subcontractor Listing Requirements, any Bond/Insurance Certificate/Insurance Endorsement Forms, Minimum Wage Information, Contractor's Price Proposal and relevant Addenda or portions thereof, which shall be deemed to be so modified and amended as set out in the balance of the Contract Documents), all other documents identified in Article 7.22 of the Agreement between the Owner and the Contractor, and any modifications, Change Orders, Addenda, or amendments to any of those documents executed after the effective date of the agreement.

A. The Drawings are identified as follows: As listed in Section 00 8100 – List of Drawings

B. The Specifications are identified as follows: As listed in Section 00 8200 – Index to Technical Specifications

C. All addenda to the Drawings/Specifications as issued during the RFP process.

OWNER/CONTRACTOR AGREEMENT

The form of Owner/Contractor Agreement to be executed is the standard NMHU Construction Agreement and General Conditions.

A sample Agreement follows.

DOCUMENT FOLLOWS

CONSTRUCTION AGREEMENT
(with Task Orders)

THIS CONSTRUCTION AGREEMENT (this **"Agreement"**) made effective _____, 20_23__ (**"Effective Date"**), is by and between _____, a ____NM Corporation_____ (the **"General Contractor"**) and the **Board of Regents for New Mexico Highlands University**, an educational institution of the State of New Mexico (**"NMHU"**). General Contractor and NMHU may be referred to collectively as the **"Parties"** or individually as a **"Party."**

RECITALS

WHEREAS, General Contractor has represented to NMHU that it is specifically qualified and has all the expertise required to perform construction services of the nature contemplated by this Agreement; and

WHEREAS, NMHU desires to engage the construction services of General Contractor for the Renovation of Sininger Hall, located at 904 National Avenue in Las Vegas, NM.

NOW THEREFORE, in consideration of the mutual terms, covenants and conditions set forth in this Agreement, General Contractor and NMHU agree as follows:

SECTION 1
DEFINITIONS

In addition to other defined terms contained in this Agreement, the following terms shall have the meaning specified below in this Section.

1.1 "Affiliate" of a Party means any other Person that, directly or indirectly, controls, is controlled by, or is under common control with such Party and any Person in which a Party has an ownership interest and to which the Party or an Affiliate of the Party provides services. For the purposes of this definition, "control" means the power to direct the management or policies directly or

indirectly whether through the ownership of voting securities, by contract, or otherwise.

1.2 "Agreement" means, collectively, this Agreement and any and all Task Orders, Change Orders, Amendments, and Construction Change Directives, which together constitute a single integrated agreement.

1.3 "Applicable Law" or "Applicable Laws" means any law, statute, act, constitution, ordinance, rule, regulation, order, decree, injunction, license, permit, consent, approval, authorization, agreement or regulation of any federal, state, tribal or local government, department, office, agency, board or commission having jurisdiction over a Party, a Subcontractor, the Work site or any portion of the Work. Applicable Laws include, without limitation, Environmental Laws, the New Mexico State Procurement Code §§13-1-28 through 13-1-199 NMSA 1978, as amended, and the Davis Bacon Act, 40 U.S.C. 276a.

1.4 "Ceiling Price" has the meaning assigned to it in **Section 4.3**.

1.5 "Change Order" or "Amendment" means a written instrument, in substantially the form attached hereto as **Exhibit B**, signed by NMHU and General Contractor stating their agreement upon the following: (a) a change in the Work; (b) an adjustment in the Task Order Sum or Rate Schedule, if any; and (c) an adjustment in the Period of Performance, if any. Each Change Order or Amendment shall be governed by the terms of this Agreement and shall reference the NMHU Agreement number and the applicable Task Order.

1.6 "Construction Change Directive" has the meaning assigned to it in **Section 5.4**.

1.7 "Contract Documents" means, collectively, this Agreement and specifications, plans, schedules and drawings approved by NMHU.

1.8 "General General Contractor's Task Order Manager" has the meaning assigned to it in **Section 7.2**.

1.9 "Damages" means any and all damages, losses, claims, obligations, demands, assessments, penalties, liabilities, costs, and expenses (including attorney fees and expenses).

1.10 "Environmental Laws" means all federal, state, tribal and local laws, rules, regulations and ordinances governing, regulating or relating to public health, pollution, petroleum and petroleum products, wastes and discarded materials and contamination or the protection of the environment, or the protection of historic, archeological or cultural resources as may be amended from time-to-time.

1.11 "Final Acceptance" means NMHU's written acceptance issued under **Section 10.3 "Final Acceptance"** to General Contractor of General Contractor's written certification to NMHU that General Contractor has fully and finally completed the Work in accordance with all of the requirements of the Contract Documents.

1.12 "Fixed Price" has the meaning assigned to it in **Section 4.1.1**.

1.13 "Hazardous Materials" means oil, petroleum products and substances, flammable substances, explosive materials, radioactive materials and any other materials, wastes or substances defined as hazardous materials, wastes or substances, toxic wastes or substances as defined under any Environmental Laws, and all similar and related federal, state, tribal and local laws, rules, regulations and ordinances, as amended from time to time, and any other materials, substances and wastes which, even if not regulated, may or could pose a hazard to human health and safety or to the environment.

1.14 "Task Order" or **"TO"** means the written authorization, in the form of **Exhibit A**, for General Contractor to perform Work under the provisions of this Agreement.

1.15 "Task Order Sum" means the total amount NMHU shall pay General Contractor for the complete performance of the Work in accordance with the Contract Documents and each applicable TO.

1.16 "Period of Performance" has the meaning assigned to it in **Section 3.1**.

1.17 "Person" means an individual, partnership, corporation, limited liability company, company, business trust, joint stock company, trust, unincorporated association, joint venture, government authority or other legally recognized entity of whatever nature.

1.18 "NMHU's Task Order Administrator" has the meaning assigned to it in **Section 7.1**.

1.19 "Prompt Payment Act" means the New Mexico Prompt Payment Act, NMSA 1978 § 57-28-1 *et seq.* (2007) as amended from time to time.

1.20 "Punch List" means a listing of all incomplete or deficient Work, identified by NMHU or identified by General Contractor and approved by NMHU as Punch List items.

1.21 "Rate Schedule" means the agreed upon prices and rates for labor, equipment and/or material submitted by General Contractor and accepted by NMHU, as more particularly described in **Exhibit E**. The Rate Schedule may only be modified by a Change Order or Amendment. General Contractor agrees that no increases to the rates and prices contained in the Rate Schedule will be submitted during the initial Term and no more than one (1) change proposing increases to the rates and prices contained in the Rate Schedule will be submitted during any renewal Term and such increases shall not exceed five percent (5%) of the previously agreed upon rates and prices.

1.22 "Required Final Completion Date" means the date by which General Contractor is required to achieve Final Acceptance as specified by the Required Final Completion Date in the applicable ITA.

1.23 "Required Substantial Completion Date" means the date by which General Contractor is required to achieve Substantial Completion as specified by the Required Substantial Completion Date in the applicable ITA.

1.24 "Set-off" means to discharge or reduce an amount that may become payable against a counterbalancing financial obligation.

1.25 "Subcontractor" means any General Contractor, constructor, materialman, manufacturer, supplier, vendor or other Person of any tier who performs or provides any portion of the Work other than General Contractor.

1.26 "Substantial Completion" means that stage in the progress of the Work when all of the following have occurred: (a) the Work is sufficiently complete, in accordance with the Contract Documents, so that NMHU has full and unrestricted use and benefit of the facilities for the purposes intended; (b) all Work expressly required to be performed prior to or for achieving Substantial Completion shall have been performed, and all required documents, drawings, plans, operations and maintenance manuals, and lien waivers have been delivered to NMHU; (c) all

Work other than incidental corrective or Punch List Work shall have been completed; (d) all systems and parts are fully functional, utilities are connected and operating normally, all required occupancy permits have been issued, the facilities are capable of being operated in a safe and proper manner in accordance with Applicable Laws, and the Work is accessible by normal vehicular and pedestrian traffic routes.

1.27 "Term" means the time period during which this Agreement shall remain in full force and effect as measured from the Effective Date to _____, unless earlier terminated as provided herein.

1.28 "Uncontrollable Forces" means any cause beyond the control of the Party affected and not due to its fault or negligence, including, but not limited to, acts of God, flood, fire, epidemic, war, terrorist activity, riot, civil disturbance, sabotage, inability to obtain permits, licenses, and authorizations from any local, state, tribal or federal agency for any of the materials, supplies, equipment, or services required to be provided hereunder, fuel shortages, breakdown or damage to power generation and transmission facilities, gas lines, strikes or other labor disturbances, or restraint by court or public authority, any of which by exercise of due foresight such Party could not reasonably have been expected to avoid, and which by the exercise of due diligence it is unable to overcome.

1.29 "Work" means the facilities, construction items, and/or services, as more particularly described in a Task Order authorized under this Agreement and performed, furnished, or provided in accordance with the Contract Documents, which includes, but is not limited to, labor, materials, supplies, equipment, structures, products, drawings, specifications, services, and permits provided to NMHU hereunder and/or required to perform the Work, and the manufacture and fabrication of components.

SECTION 2
THE WORK

2.1 The Work. General Contractor shall perform the entire Work in a timely manner as may be authorized by NMHU from time-to-time through issuance of a Task Order for such Work. The terms of this Agreement shall be applicable to each Task Order. General Contractor shall perform the Work in accordance with the Contract Documents and Applicable Laws. NMHU makes no guarantee as to the volume of Work NMHU may authorize under this Agreement. NMHU may perform certain work similar to that furnished hereunder with its own forces, or by

the use of services of another General Contractor. **General Contractor expressly acknowledges and agrees that NMHU may enter into similar contractual arrangements with other parties and that NMHU may assign similar work to such other parties.**

2.2 Exhibits. The following attachments and exhibits are hereby made part of the Contract Documents:

A	Form of Task Order
B	Form of Change Order and Amendment
C-1	Form of Partial Lien Waiver
C-2	Form of Final Lien Waiver
D-1	Form of Substantial Completion Certificate
D-2	Form of Final Completion Certificate
E	Cost Schedule

2.3 Interpretation.

2.3.1 The Contract Documents are complementary and what is called for by one is as binding as if called for by all. If General Contractor finds a conflict, error, or discrepancy in the Contract Documents, General Contractor will call it to NMHU's attention in writing before proceeding with provision of the Work affected thereby. In resolving such conflicts, errors, or discrepancies, the Contract Documents shall be given precedence in the following order: (a) Change Order or Amendment, (b) Task Order, and (c) the Agreement.

2.3.2 Among all the Contract Documents, the term or provision that is most specific or includes the latest date shall control. Information identified in one Contract Document and not identified in another shall not be considered to be a conflict or inconsistency. In any case of omissions or errors in figures, drawings or specifications, the General Contractor shall immediately submit the matter to NMHU and, if directed, to its consultant for clarification. NMHU's clarifications are final and binding on all parties.

2.3.3 Where figures are given, they shall be preferred to scaled dimensions.

2.3.4 Any terms that have well-known technical or trade meanings, unless otherwise specifically defined in this Agreement, shall be interpreted in accordance with their well-known meanings.

SECTION 3
CONSTRUCTION SCHEDULE

3.1 Period of Performance. General Contractor shall commence the Work on or before the commencement date set forth in the applicable Task Order and shall diligently prosecute the Work to achieve Substantial Completion on or before the Required Substantial Completion Date set forth in such Task Order and to achieve Final Acceptance before the Required Final Completion Date set forth in such Task Order (**"Period of Performance"**). General Contractor acknowledges and agrees that time is of the essence.

The period of performance for this Agreement is **July 3, 2023 through March 2024 (nine months).**

3.2 Delays and Time Extensions. General Contractor shall promptly notify NMHU in writing of any actual or anticipated event that is delaying or could delay the Period of Performance. General Contractor shall indicate the expected duration and anticipated effect of the delay, and the action being taken to correct the problem and make up for lost time. Provision of such notice does not relieve General Contractor of its obligations to complete the Work within the Period of Performance. Without limiting the foregoing, General Contractor shall not be entitled to an adjustment in Period of Performance or in the Task Order Sum or Rate Schedule, if applicable, for any delay or failure of performance to the extent such delay or failure was caused by General Contractor or anyone for whose acts General Contractor is responsible, or otherwise was within General Contractor's reasonable control. All time extensions and adjustments to the Task Order Sum for which General Contractor is entitled, if any, shall be incorporated into the Contract Documents through the execution of a Change Order or Amendment.

3.3 Progress Reports. General Contractor shall furnish NMHU with progress and cost reports and schedules and such other reports concerning the Work on a weekly basis.

SECTION 4
COMPENSATION

4.1 Task Order Sum. For timely completion of the Work in accordance with the terms of the applicable Task Order, NMHU shall pay General Contractor in accordance with this Section, the Task Oder Sum specified in the applicable Task

Order, plus, subject to **Section 16.9 "Taxes,"** applicable New Mexico gross receipts taxes which are payable by General Contractor to the relevant taxing authority. The Task Order Sum shall be based on either a Fixed Price or on time and materials as set forth below. The Task Order Sum shall constitute the sole compensation payable to General Contractor for performance of the Work or anything done in connection therewith, and General Contractor shall NOT be entitled to additional compensation or reimbursement of expenses for complying with the terms and conditions set forth in this Agreement.

4.1.1 Fixed Price. If the applicable Task Order provides that the Task Order Sum is payable on a Fixed Price basis, such price (**"Fixed Price"**), except as specifically otherwise provided for in the Contract Documents or the applicable Task Order, shall constitute the sole compensation payable to General Contractor for performance of the Work or anything done in connection therewith. Notwithstanding anything contained herein to the contrary, General Contractor shall not be entitled to compensation or reimbursement of costs in excess of such Fixed Price. Costs that would cause such Fixed Price to be exceeded shall be borne and paid by the General Contractor without reimbursement by NMHU.

New Mexico Highlands University shall pay the General Contractor selected by the NMHU Board of Regents under this Agreement a Fixed Price NOT TO EXCEED $6,700,000.00, (six million, seven hundred thousand dollars) for the scope of work outlined in this Agreement and outlined in all Construction Drawings and Documents pertaining to the Renovation of Sininger Hall. The Fixed Price of $6.7M shall include all labor and materials, General Contractor's overhead and profit, all licenses, insurances, bonds, permits, LEED, etc. required to perform the job. The General Contractor shall NOT be entitled to additional compensation or reimbursement of expenses in excess of the $6.7M Fixed Price.

$6,180,812	(Includes all labor, materials, and equipment, GC's Overhead + Profit, all licenses, insurances, bonds, permits, etc.)
$519,188	NMGRT at 8.4% (rounded)
$6,700,000	

General Contractor shall comply with LEED certifications for this project, which include: Completion of LEED submittal templates, documentation and uploading to LEED on-line for all contractor assigned credits.

New Mexico Highlands University (NMHU) shall directly hire and direct a separate General Contractor to coat the roof and install new gutters.

New Mexico Highlands University shall hire and direct a separate General Contractor to install solar panels on the roof. (All electrical tie-ins to the panels shall be the responsibility of the GC hired under this contract.)

New Mexico Highlands University shall hire and direct a separate General Contractor to 1) re-stucco the exterior walls of the building and 2) to install the water catchment system at the exterior west side of the building. (All electrical or plumbing tie-ins to the water catchment system shall be the responsibility of the GC hired under this contract.)

New Mexico Highlands University shall hire and direct a separate contractor to purchase and install access control locks on the exterior doors of the building.

New Mexico Highlands University shall hire and direct a vendor to purchase and install all window shades and carpeting that is called for in the construction drawings. (The GC hired under this contract shall be responsible for all other flooring, cove base, and materials.)

New Mexico Highlands University shall purchase and install all furniture and equipment for the building.

New Mexico Highlands University shall hire and direct a contractor to upgrade the elevator.

The General Contractor hired under this RFP and Agreement shall work closely and in good faith to coordinate a schedule a head of time with all subcontractors hired by NMHU to seamlessly integrate the scope of their work with the General Contractor's.

4.1.2 Time and Materials. If the applicable Task Order provides that the Task Order Sum is payable on a time and materials basis, then the following terms shall apply:

4.1.2.1 Labor. NMHU shall pay to General Contractor for the performance of Work the cost of all direct labor for regular hours (and overtime hours if authorized in writing by NMHU's authorized representative) at the rates set forth in the Rate Schedule and applicable Task Order for time reasonably spent by General Contractor's employees in directly performing Work set forth in such Task Order. Such rate(s) shall comply with the State of New Mexico's Wage Rate Decisions and include all overhead, administrative costs and profit margins and General Contractor shall not be separately compensated for such items.

General Contractor shall work with NMHU and submit all documents required in a timely basis to comply with the NM Public Works Prevailing Wage Rates and Minimum Wage Act Policy. State wage rates will also be posted on site in a visible area by the General Contractor.

4.1.2.2 Materials. Subject to approval by NMHU of individual invoices or vouchers, NMHU shall pay General Contractor the net invoice cost or charges for direct materials supplied by General Contractor. Direct materials, as referenced in this Section, are defined as those materials which enter directly into the Work, or which are incorporated into or consumed directly in connection with the furnishing of such Work. The General Contractor must not charge NMHU any additional costs for direct materials.

4.1.2.2.1 General Contractor must procure materials at the most advantageous prices available with due regard to securing prompt delivery of satisfactory materials, and take all cash and trade discounts, rebates, allowances, credits, salvage, commissions, and other benefits. Credit shall be given to NMHU for cash and trade discounts, rebates, allowances, credits, salvage, the value of resulting scrap, commissions, and other amounts which have been accrued to the benefit of the

General Contractor, or would have so accrued except for the fault or neglect on the part of General Contractor. Such benefits lost through no fault or neglect on the part of General Contractor, or lost through fault of NMHU, shall not be deducted from gross costs.

4.1.2.2.2 When the nature of the Work to be performed requires General Contractor to furnish material which is regularly sold to the general public in the normal course of business by General Contractor, the price to be paid for such material, notwithstanding **Section 4.1.2.2.1**, shall be on the basis of an established catalog or list price, in effect when the material is furnished, less all applicable discounts to NMHU.

4.1.2.3 Other Direct Expenses. To the extent provided for in an applicable Task Order, General Contractor shall be paid net invoice cost or charges for other direct expenses reasonably incurred by General Contractor in performing the Work, such as pre-approved payments to third parties for services, subcontract work and special equipment rental.

4.2. **Payment.** The Task Order shall provide that the Task Order Sum is payable in progress payments or in a single sum, and shall be subject to the following requirements.

4.2.1 Progress Payments. At monthly intervals, if not otherwise provided in the Task Order, General Contractor shall submit to NMHU partial lien waivers executed by General Contractor and each Subcontractor (in the form attached hereto as **Exhibit C-1**), a progress report, and a progress payment invoice, for milestones or other categories of Work properly performed and completed in accordance with the Contract Documents, which shall be supported by such substantiating data as NMHU may require, including, but not limited to, General Contractor's certification and proof that all work for the applicable milestone or category has been completed in accordance with the Contract Documents and reconciling the progress payment invoices with the Work completed to date and any work progress schedule setting forth a timeline for completion of categories of Work as required by a Task Order and showing separately all New Mexico gross receipts taxes claimed and indicating the amounts to which they apply. Upon Substantial Completion of the Work, General Contractor shall submit a request for progress payment

requesting payment of the remaining amount of the Task Oder Sum, less one hundred percent (100%) of the agreed upon value of the Punch List Work. Upon Final Acceptance of the Work, General Contractor shall submit a final payment invoice in accordance with this Section and **Section 4.2.2 "Final Payment or Single Sum Payment."** NMHU may, but is not required to, authorize progress payments for materials delivered to the Work site and any preparatory Work performed by General Contractor. Payments shall not constitute acceptance of defective or nonconforming Work or otherwise relieve General Contractor of any obligation under this Agreement.

4.2.2 Final Payment or Single Sum Payment. Prior to delivery of any final payment invoice under the Contract Documents or payment of a Single Sum, General Contractor shall complete all Work, including Punch List Work, and shall execute and deliver to NMHU final waivers of liens and claims executed by General Contractor and all Subcontractors and suppliers (in the form attached hereto as **Exhibit C-2**) and other evidence in form and substance satisfactory to NMHU that (a) all indebtedness, including liens, with respect to or in connection with the Work has been paid, and (b) there are no other outstanding liabilities in connection with the Work. NMHU shall pay the final payment invoice, subject to the terms and conditions set forth herein, provided that (a) NMHU General Contractor's duly certified voucher for payment and General Contractor's certification and proof that all Work, including Punch List Work, has been completed in accordance with the Contract Documents and (b) Final Acceptance has occurred.

4.3 Ceiling Price. If the applicable Task Order provides that the Task Order Sum is payable on a time and materials basis, then the total cost to NMHU for the performance of Work under a Task Oder shall not exceed the **"Ceiling Price"** set forth in such Task Order. General Contractor shall use its best efforts to perform the Work specified therein and all obligations under this Agreement within such Ceiling Price**.** Notwithstanding anything to the contrary contained herein, General Contractor shall not be entitled to compensation or reimbursement of costs in excess of such Ceiling Price. Costs that would cause the Ceiling Price to be exceeded shall be paid by the General Contractor without reimbursement by NMHU.

4.4 Prompt Payment by NMHU of Complete, Undisputed Invoices. If NMHU does not dispute or question an invoice, then, subject to the terms and conditions set forth herein, NMHU shall pay General Contractor the full amount of the invoice within thirty (30) days of receipt of the undisputed invoice and all

waivers of liens and claims and other documents to be delivered in connection with such invoice; and if NMHU fails to do so, then NMHU shall pay interest on such amounts due and owing at the rate and for the time period specified from time-to-time in the Prompt Payment Act.

4.5 Incomplete or Disputed Invoices. If an invoice is improperly completed, then within seven (7) days of receipt, NMHU or its designee may notify General Contractor in writing how the invoice is improperly completed. Following such written notice, NMHU shall have no further duty to pay the improperly completed invoice until it is resubmitted and properly completed. In the event NMHU disputes any items included in the invoice, then NMHU shall deduct the items in dispute and, subject to the terms and conditions set forth herein, pay the undisputed portion of the invoice amount, less amounts that NMHU is entitled to withhold, deduct, retain or offset, within thirty (30) days of receipt of the disputed invoice and all waivers of liens and claims and other documents to be delivered in connection with such invoice. NMHU shall promptly notify General Contractor of the amount withheld for disputed items. When the accuracy of the withheld items is established or an adjustment has been agreed upon between the Parties, NMHU shall pay General Contractor for such items agreed upon (less the other amounts that NMHU is entitled to withhold, deduct, retain or offset). If the Parties are unable to agree, the matter shall be resolved in accordance with **Section 12 "Dispute Resolution**."

4.6 General Payment Terms and Conditions.

4.6.1 By submitting an invoice, General Contractor is (a) certifying that all amounts due and payable to Subcontractors and suppliers have been paid and (b) recertifying that the representations set forth in **Section 9.1 "Representations"** are true and correct as of the date of the invoice.

4.6.2 Failure by NMHU to withhold any amounts under an invoice shall not be construed as accepting or acquiescing to any disputed claims. In addition, the making of any payment shall not constitute acceptance of defective or nonconforming Work, shall not constitute an admission by NMHU that the Work is satisfactory or timely performed, and shall not relieve General Contractor of any obligation under this Agreement.

4.6.3 Notwithstanding any other provision to the contrary contained herein, NMHU shall have no obligation to make payments to General Contractor

hereunder at any time when General Contractor is in breach of this Agreement.

4.7 Prompt Payment by General Contractor of Subcontractors and Suppliers. General Contractor and all Subcontractors shall make prompt payment, within ten (10) days after receipt of payment from NMHU or General Contractor, to their respective subcontractors and suppliers for amounts owed for material or services performed for the Work. If General Contractor or any Subcontractor fails to make such prompt payment, then General Contractor and such Subcontractor shall pay interest on such amounts owed at the rate and for the time period specified from time-to-time in the Prompt Payment Act.

4.8 Set-offs. NMHU shall have the right to Set-off and/or net out any amounts which NMHU may owe to General Contractor under a Task Order or otherwise, against any amounts which General Contractor may owe to NMHU under such Task Order or otherwise.

4.9 Overpayment; Underpayment. Each payment made shall be subject to reduction and refund to NMHU, or offset on future payments due General Contractor, to the extent of amounts which are found by NMHU not to have been properly payable or to have been overpaid, and shall also be subject to increase and payment to General Contractor for underpayments to the extent of any amounts which are found by NMHU to have been underpaid.

SECTION 5
CHANGES IN THE WORK

5.1 Change Order or Amendment. The Work, Task Order Sum, Rate Schedule, if any, and Period of Performance (including the Required Substantial Completion Date) shall only be changed by a Change Order or Amendment. The Change Order or Amendment shall constitute full and final settlement of all claims arising from or related to any Work either covered or affected by the Change Order or Amendment, or related to the events giving rise to the request for adjustment, including, without limitation, claims for time and for costs, including costs of delays, inconvenience, disruption of schedule, or loss of efficiency or productivity. This Agreement may only be changed, modified, or amended by an Amendment signed by both parties.

[Option A]

5.2 Individuals Authorized to Make Changes. NMHU Task Order Supervisor identified in **Section 7.1 "NMHU Task Order Supervisor"** may approve and sign a Change Order or Amendment for any addition, deletion, revision, or other changes in the Work which are within the general parameters of the scope of Work and which, together with any prior Change Orders, do not result in more than a 5% cumulative increase in the Task Order Sum specified in **Section 4.1 "Task Order Sum"** above and/or more than a 5% increase in the Period of Performance specified in **Section 3.1 "Period of Performance"** above. All other Change Orders or Amendments must be approved and signed on behalf of NMHU by the NMHU Purchasing Department or the Vice President for Finance & Administration. General Contractor's Task Order Manager identified in **Section 7.2 "General Contractor's Task Order Manager"** may approve and sign any Change Order on behalf of General Contractor.

[Option B]

5.2 Individuals Authorized to Make Changes. All Change Orders or Amendments must be approved and signed on behalf of NMHU by NMHU's Purchasing Department. General Contractor's Task Order Manager identified in **Section 7.2 "General Contractor's Task Order Manager"** may approve and sign any Change Order or Amendment on behalf of General Contractor.

5.3 Change Order Request. NMHU may, at any time, request a written Change Order proposal from General Contractor. General Contractor shall submit a Change Order proposal within five (5) business days of its receipt of the request by NMHU. General Contractor's Change Order proposal shall include full compensation for implementing the proposed change in the Work, including any adjustment in the Task Order Sum or Period of Performance, and including all delays in connection with such change in the Work and for any expense or inconvenience, disruption of schedule, or loss of efficiency or productivity occasioned by the change in Work. Such a change is not binding until the Parties execute a Change Order.

5.4 If No Agreement. If NMHU and General Contractor are unable to reach agreement on the terms of any change in Work, including adjustment in the Task Order Sum or Period of Performance, NMHU may issue a written directive to perform the Work (**"Construction Change Directive"**). The Construction Change Directive shall describe the Work to be performed and General Contractor will be compensated on a time and materials basis in accordance with **Section 4.1.2 "Time and Materials"** or, if compensated on a Fixed price basis, General

Contractor will be paid for its actual costs of labor and materials plus five percent (5%) for profit and overhead expenses. If NMHU does not issue a Construction Change Directive, then the matter shall be resolved in accordance with **Section 12 "Dispute Resolution."**

SECTION 6
WARRANTY, INSPECTION AND AUDIT

6.1 Warranty.

6.1.1 In addition to any warranties provided elsewhere in the Contract Documents, General Contractor warrants that all Work conforms to the requirements of the Contract Documents and is free of any defect in equipment, material, or design furnished, or workmanship performed, by General Contractor.

6.1.2 Except as otherwise expressly provided in the Contract Documents, General Contractor shall remedy at its own expense any of the Work performed by any unqualified employees or Subcontractors, any failure of the Work (including equipment) to conform or adhere to specifications and requirements of the Contract Documents and any defect of material, workmanship, or design in the Work (excluding any defect of design furnished by NMHU under this Agreement), provided that NMHU gives General Contractor notice of any such failure or defect promptly after discovery, but no later than two (2) years after Final Acceptance of the Work (**"Warranty Period"**). General Contractor, at its own expense, shall also remedy damage to equipment, the Work site, the buildings and contents thereof, and other property which is the result of any defect in the Work or failure of the Work to conform or adhere to the requirements of the Contract Documents, and restore any Work damaged in fulfilling the terms of this Section. All Work repaired or replaced pursuant to this Section or any other provision of this Agreement shall also be subject to the provisions of this Section to the same extent as Work originally performed, except that the Warranty Period with respect thereto shall run for a period of two (2) years from the date of completion of the repair or replacement.

6.1.3 All Subcontractors', manufacturers', and suppliers' warranties and guarantees, express or implied, respecting any part of the Work and any materials used therein shall be deemed obtained by General Contractor for the benefit of NMHU without the necessity of separate transfer or

assignment thereof. However, General Contractor shall use its best efforts to cause all written warranties and guarantees to name NMHU as the recipient and beneficiary. General Contractor shall execute such transfer and assignment documents as requested by NMHU to assign all warranties and guarantees to NMHU. If directed by NMHU. General Contractor shall require such Subcontractors, manufacturers, and suppliers to execute such warranties and guarantees in writing to NMHU.

6.1.4 All materials and equipment furnished by General Contractor shall be new (unless otherwise specified), and both workmanship and materials shall be of good quality. Equipment and materials which are provided, but fail to comply with the requirements of the Contract Documents, shall be modified, adjusted, repaired, or removed and replaced with complying equipment and materials at General Contractor's sole expense. However, if the progress of Work is such to make such removal impractical, NMHU shall have the right to accept it and reduce the Task Order Sum by an amount equivalent to the difference in its value and the value of complying equipment or materials.

6.1.5 All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processor, except as specifically provided in the Contract Documents or the applicable Task Order.

6.1.6 General Contractor shall bear all costs and expenses associated with performing its obligations under this Section, including, without limitation, necessary disassembly, transportation, reassembly and retesting, as well as reworking, repair or replacement of Work, and disassembly and reassembly of piping, ducts, machinery, equipment or other Work as necessary to give access to improper, defective or nonconforming Work.

6.2 Inspection and Testing. All Work shall be subject to reasonable inspection by NMHU, or its representatives and/or consultants at all times to determine whether the Work conforms to the Contract Documents. NMHU may perform such factory or field tests or other tests as it deems necessary to verify that equipment and other Work meet the performance standards required hereunder. General Contractor shall be permitted to witness such tests. General Contractor shall provide NMHU access to the Work wherever located. NMHU may visit and inspect the Work and materials, or any part thereof, at any time, and General Contractor shall provide safe and proper access for inspection of the Work. If NMHU requests or requires that any Work be tested, inspected or approved before

it is covered over, enclosed, encased or sealed and General Contractor fails to provide NMHU with a reasonable opportunity to complete such testing, inspection or approval, then General Contractor shall uncover, open or unseal such Work at General Contractor's expense. Inspections and tests, if made by or on behalf of NMHU, shall not in any way relieve General Contractor from its responsibility with respect to its obligations under the Contract Documents. General Contractor shall furnish promptly, without additional cost to NMHU, all reasonable facilities, labor, and materials necessary for the safe and convenient inspection and testing that may be required by NMHU. All inspections and tests by NMHU shall be performed in such manner as not to unnecessarily delay the Work. General Contractor shall be charged with any additional cost of inspection when materials and workmanship are not ready at the time the inspection is required by NMHU. General Contractor shall provide advance notice to NMHU of any tests to be performed by General Contractor hereunder, and NMHU may be present at any test.

6.3 Correction of Defects. If General Contractor does not take action to correct any defects or deficiencies for which it is responsible under the Contract Documents within a reasonable time after receipt of NMHU's written notice thereof, NMHU may, at its sole option, (a) terminate the right of General Contractor to proceed with the Work as provided in **Section 11.3 "Termination by NMHU for Cause,"** (b) take such corrective action itself or contract with others to correct the Work and in each case charge General Contractor (directly or as an offset against amounts due General Contractor under this Agreement) for all such costs incurred by NMHU, (c) deduct an equitable amount from the Task Order Sum for defects or deficiencies in the Work in lieu of correcting Work that was not performed in accordance with the Contract Documents, and/or (d) proceed in accordance with **Section 6.4 "Taking Over and Stopping Work."**

6.4 Taking Over and Stopping Work. If General Contractor fails or refuses to perform its obligations in accordance with the Contract Documents, NMHU may order General Contractor, in writing, to stop the Work or any portion thereof, until satisfactory corrective action has been taken. NMHU may, at its sole option, take any corrective or remedial action itself or contract with others to take corrective or remedial action and in each case charge General Contractor (directly or as an offset against amounts due General Contractor under this Agreement) for all such costs incurred by NMHU.

6.4.1 General Contractor shall not be entitled to any adjustment in the Period of Performance or Task Order Sum for any increased cost or time of

performance attributable to General Contractor's failure or refusal to perform or from any reasonable remedial action taken by NMHU based upon such failure.

6.4.2 NMHU may, in its absolute discretion, stop the Work at any time, in accordance with **Section 11 "Default and Termination," Section 11.3 "Termination by NMHU for Cause"** and **Section 11.4 "Termination by NMHU for Convenience."**

6.5 No Exclusive Remedy. General Contractor's obligations under this Section 6 shall not be impaired or otherwise adversely affected by any actual or possible legal obligation or duty of any Subcontractor to General Contractor or to NMHU. The rights and remedies of NMHU provided for in this Section 6 are in addition to and do not limit any other rights and remedies available to NMHU under any other provision of the Contract Documents or at law or in equity.

6.6 Records; Audit. General Contractor shall maintain complete and accurate records concerning the Work and all related transactions for at least five (5) years from the date of Final Acceptance. General Contractor's obligation to maintain complete and accurate records under this Section shall include, but is not limited to, records relating to compliance with Applicable Laws relating to employee certifications and qualifications, drug and alcohol use, and, if applicable, United States Department of Transportation requirements. At any time, but not later than five (5) years after final payment under this Agreement, NMHU may make such audit of General Contractor's records and substantiating material as deemed necessary by NMHU. Each payment made shall be subject to reduction and refund to NMHU, or offset on future payments due General Contractor, to the extent of amounts which are found by NMHU not to have been properly payable or to have been overpaid, and shall also be subject to increase and payment to General Contractor for underpayments to the extent of any amounts which are found by NMHU to have been underpaid. Upon request by NMHU, General Contractor shall insert a clause containing all the provisions of this Section in all subcontracts to permit NMHU to make identical audits and inspections of the records of all Subcontractors involved in performance of the Work.

SECTION 7
REPRESENTATIVES AND NOTICES

7.1 NMHU's Task Order Supervisor. NMHU appoints the individual identified in each applicable Task Order as **"NMHU's Task Order Supervisor"**

for that particular Task Order. NMHU's Task Order Supervisor shall have the authority to (a) issue instructions, (b) interpret plans, (c) review and inspect General Contractor's Work, (d) reject nonconforming Work, (e) determine when Work is complete, (f) approve progress payments and final payment, and (g) approve certain Change Orders or Amendments as set forth in **Section 5 "Changes in the Work."** All communications from General Contractor to NMHU pursuant to this Section shall be directed to NMHU's Task Order Supervisor. NMHU may appoint another NMHU Task Order Supervisor at any time by written notice to General Contractor.

7.2 General Contractor's Task Order Manager. General Contractor appoints the individual identified in each applicable Task Order as **"General Contractor's Task Order Manager"** in charge of General Contractor's performance and execution of the Work for that particular Task Order. All instructions, requests for Change Orders and other communications from NMHU to General Contractor shall be directed to the Task Order Manager, the architects on record, and NMHU's construction manager. General Contractor may appoint another General Contractor's Task Order Manager upon ten (10) days' prior written notice to NMHU. If NMHU objects to the new appointee, General Contractor shall appoint a General Contractor's Task Order Manager acceptable to NMHU.

7.3 Notices and Invoices. Except as expressly provided otherwise herein, any formal notice, demand, consent or request provided for in the Contract Documents shall be in writing and shall be deemed properly made if personally delivered, delivered by courier, sent by first-class mail, postage prepaid, sent by facsimile to the facsimile number of the Person specified below, or sent by NMHU through other electronic means, and shall be deemed received, if personally delivered, or delivered by courier, upon delivery, and if mailed, on the third day following deposit in the U.S. mail, and if sent by facsimile, upon transmission as evidenced by a confirmation report generated by the facsimile device and if by electronic means, upon receipt in recipient's email inbox as evidenced by date stamps.

To General Contractor: _____

Mailing Address: _____

_____

Attn: _____

Phone: _____

Facsimile Number: _____

Email: _____

To NMHU: New Mexico Highlands University
Mailing Address: Facility Service Dept.
Box 9000
Las Vegas, NM 87701
Attn: Sylvia Baca
Phone: (505) 426-2048
Facsimile Number: (505) 426-3120
Email: sbaca@nmhu.edu

General Contractor shall submit invoices to NMHU referencing this Agreement number and Task Order number, together with such documentation as NMHU may require, at the following address:

New Mexico Highlands University
Facilities Services Department
Box 9000
Las Vegas, NM 87701
Attention: Sylvia Baca, Facilities & Planning Director

7.4 Changes. The Parties may change their addresses, contact persons, or facsimile numbers to which notices are to be sent by providing the other Party with notice of such changes in the manner provided in this **Section 7**.

7.5 Ordinary Course. Nothing contained herein shall preclude the transmission of routine invoices or correspondence, messages and information between the Parties by a representative of a Party in the ordinary course of performing their respective obligations under this Agreement.

SECTION 8
WORK SITE

8.1 Site Investigation. Notwithstanding the fact that General Contractor may have received certain site information from NMHU, General Contractor represents to NMHU that General Contractor has independently satisfied itself as to the nature and location of the Work, the general and local conditions, particularly those bearing upon transportation, disposal, and handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather,

river stages, or similar physical conditions at the Work site, the conformation and conditions of the ground, the character, quality, and quantity of surface and subsurface materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of Work, and all other matters which can in any way affect the Work, the time of completion or the cost thereof under the Contract Documents.

8.2 Lines and Grades. General Contractor shall establish construction base lines and benchmarks at the Work site. General Contractor shall be responsible for the proper execution of the Work to said base lines and bench marks, and all stakes or other markers established shall be preserved by General Contractor until their removal is authorized by NMHU. NMHU may, from time-to-time, check the layout of General Contractor, but such checking shall in no way relieve General Contractor of its responsibility for the accuracy of General Contractor's Work. General Contractor shall provide, at the request of NMHU and without additional cost to NMHU, competent personnel to assist in this checking.

8.3 Specifications and Drawings. General Contractor shall submit all specifications and drawings governing the Work to NMHU for review and comment. [NMHU or its consultant shall provide specifications and drawings required for the completion of the Work, except the following: _____ _____. General Contractor shall review the specifications and drawings in an effort to identify potential constructability problems that could impact General Contractor's ability to perform the Work in an expeditious and economical manner. In addition, General Contractor shall promptly report to NMHU any errors or omissions which it discovers in the specifications and drawings. **NOTE: This provision is used in place of the first sentence in this Section when NMHU or its consultant prepares the specifications and drawings.**] General Contractor shall revise such specifications and drawings from time to time to reflect any approved changes or actual installation of equipment. General Contractor shall maintain at the Work site a copy of the specifications and drawings governing the Work with all changes and modifications, and shall at all times give NMHU and its contractors access. Anything mentioned in the specifications and not shown on the drawings or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of discrepancy, either in figures, in the drawings, or in the specifications, the matter shall promptly be submitted to NMHU's Task Order Supervisor who shall promptly make a determination in writing to resolve the discrepancy. Any adjustment by General Contractor without such determination shall be at its own risk and expense.

8.3.1 "As-Built" Drawings. If applicable, General Contractor shall provide and keep at the Work site, a complete **"As-Built"** record set of drawings (also called **"record drawings"**) that shall be corrected daily and shall show every change from the original "approved" drawings and specifications. These changes shall be forwarded to NMHU periodically. The drawings shall reflect exact and actual "As-Built" conditions of construction, installation, and erection as it progresses. Where drawings are not adequate to show "As-Built" conditions, General Contractor shall prepare sketches which delineate the necessary "As-Built" information. General Contractor shall furnish two (2) sets of all paper "blue-line" prints "approved" drawings for use in accomplishing specified mark-up. Final "As-Built" drawings, and a computerized disk of such drawings, shall be delivered to NMHU by General Contractor upon completion of the Work.

8.4 Use of Premises. General Contractor shall confine the storage of materials and construction equipment in locations acceptable to NMHU and in accordance with all Applicable Laws. General Contractor shall provide adequate safety barriers, signs, lanterns, and other warning devices and services to properly protect any person having access to or near the Work site. General Contractor shall enforce NMHU's instructions concerning the location of signs and posters, the time and location of the burning of debris, and any other similar nuisance items.

General Contractor shall post a SWPPP (storm water pollution prevention plan) and enforce SWPP at the worksite.

8.5 Cleaning Up. General Contractor shall, at all times, keep the Work area, including storage areas used by it, in a clean and orderly condition and free from weeds, combustible debris, and waste materials. Upon completion of the Work, General Contractor shall remove all rubbish from and about the premises and restore the Work site and material storage locations to their original condition. General Contractor, unless otherwise directed, shall return all unused material to a NMHU designated storage area.

8.6 Underground Facilities. General Contractor shall be familiar with the requirements of the Underground Facility laws of the State of New Mexico, NMSA 1978 § 62-14-1, *et seq*, (1987). It will be General Contractor's responsibility to ensure compliance with such Underground Facility laws in the performance of the Work, including requesting that the owners or operators of Underground Facilities locate all such facilities in the area of the Work site (e.g.

gas, electric, telephone, water, drain lines, sewer). General Contractor shall take reasonable steps to maintain markings of owners and operators and to cooperate with the owners and operators to facilitate the location of Underground Facilities. General Contractor shall take the necessary steps to safeguard these Underground Facilities. General Contractor shall notify the Underground Facility owner or operator and NMHU's Task Order Supervisor in the event of any damage to an Underground Facility. General Contractor shall indemnify, defend and hold harmless NMHU and its employees, directors, officers, representatives, agents, advisors, and consultants from and against any and all Damages asserted or awarded against or incurred by such indemnitees arising out of, resulting from or relating to such Underground Facilities.

8.7 Other Contracts. NMHU may undertake or award other contracts for additional work at or near the Work site. General Contractor shall fully cooperate with the other General Contractors and with NMHU employees, representatives and agents carefully coordinate scheduling and shall not commit nor permit any act that will interfere with the performance of work by any other General Contractor or by NMHU employees, representatives and agents.

SECTION 9
GENERAL CONTRACTOR'S REPRESENTATIONS

9.1 Representations. In addition to other representations and warranties contained in the Contract Documents, General Contractor represents, warrants and covenants to NMHU now and upon execution of each Task Order that:

(a) General Contractor has performed work similar to the Work and possesses the specific training, skills, knowledge, necessary personnel and legal right to perform the Work. General Contractor shall provide, in connection with the Work, the standard of care, skill, and diligence normally provided by a General Contractor in the performance of work similar to the Work and warrants that all such Work shall be performed in accordance with sound and accepted industry standards and practices, and in accordance with all Applicable Laws.

(b) General Contractor's employees assigned to the Work have all necessary certifications and licenses and are fully qualified to perform their respective tasks.

(c) General Contractor will be registered with the NM Public Works Department and conform to all Public Works Prevailing Wage Rates and Public Works Minimum Wage Act Policy and project requirements and shall provide NMHU with an "Intent to Pay Prevailing Wages," Affidavit of Wages Paid" (at the completion of the project prior to receiving final payment), and all payroll statements that show evidence of compliance during the course of the project.

(d) The Task Order Sum is reasonable compensation for the Work and the Period of Performance is adequate for the performance of the Work, as represented by the Contract Documents and General Contractor's independent investigation of site conditions.

(e) General Contractor is financially solvent, able to pay its debts as they mature, and possesses sufficient working capital to complete the Work and perform General Contractor's obligations required by the Contract Documents.

(f) General Contractor is able to furnish the plant, tools, materials, supplies, equipment, services and labor required to complete the Work and perform the obligations required by the Contract Documents, and has sufficient experience and competence to do so, and is properly insured and licensed to perform the Work.

(g) General Contractor is the holder of, or will take the necessary action to obtain and maintain, all exemptions, consents, licenses, permits, or other authorizations required to allow it to operate or conduct its business now and as contemplated by this Agreement and to perform the Work under this Agreement in compliance with all Applicable Laws. General Contractor is and shall at all times be in compliance with all Applicable Laws.

(h) Neither General Contractor, nor any of its employees has been, is not presently, nor shall be a party or person with whom a "U.S. Person" (as defined in Executive Order 13224) is prohibited from transacting business with under Applicable Laws. All evidence of identity provided by General Contractor to NMHU is true and accurate.

9.2 Survival of Representations and Warranties. The representations and warranties of General Contractor herein shall be continuing representations and warranties and shall survive execution and termination of this Agreement.

9.3 NMHU Disclaimer. NMHU makes no representations or warranties to General Contractor. NMHU assumes no responsibility for any understanding or representations made by any of its employees, officers or agents during or prior to the negotiation and execution of the Contract Documents, or otherwise, including but not limited to representations concerning site conditions.

SECTION 10
COMPLETION OF THE WORK; TITLE AND RISK OF LOSS

10.1 Substantial Completion. When General Contractor believes it has achieved Substantial Completion of the Work, General Contractor shall tender an executed Substantial Completion Certificate to NMHU in substantially the form attached hereto as **Exhibit D-1** together with documentation sufficient for independent verification. NMHU shall accept or reject General Contractor's Substantial Completion Certificate in writing within five (5) business days of receipt of General Contractor's certification. If NMHU accepts General Contractor's Substantial Completion Certificate, NMHU shall take possession and control of the Work. If NMHU rejects General Contractor's Substantial Completion Certificate, NMHU shall identify its reasons for rejection in detail sufficient for verification and thereafter General Contractor shall:

(a) accept the reasons for such rejection and take prompt corrective action and then submit a new Substantial Completion Certificate to NMHU for consideration as provided for above; or

(b) disagree with NMHU's reasons for such rejection, promptly notify NMHU, and the Parties shall attempt to resolve the disagreement without delay. If the disagreement cannot be resolved within five (5) business days, then General Contractor may seek its remedy under **Section 12 "Dispute Resolution."**

10.2 Punch List. At the time of submitting a Certificate of Substantial Completion, General Contractor shall prepare and submit to NMHU a Punch List and an estimate of costs necessary to complete the Punch List. NMHU shall have five (5) business days from receipt of said Punch List to accept or reject all or any part of the Punch List. If NMHU or its contractors reject all or any part of the

Punch List, NMHU or its contractors shall provide detailed reasons for such rejection. Upon rejection of all or any part of the Punch List, General Contractor shall submit a revised Punch List satisfying the detailed rejection provided by NMHU. General Contractor shall diligently pursue completion of the Punch List, without interfering with the use or operation of the facilities or other Work, and shall notify NMHU in writing of General Contractor's determination that the Punch List Work is complete. NMHU shall have five (5) business days to accept or reject General Contractor's determination that the Punch List Work is complete. If NMHU or its contractors reject General Contractor's determination, the matter shall be resolved in accordance with the procedures set forth in **Section 10.1 "Substantial Completion."**

10.3 Final Acceptance. When General Contractor believes it has achieved full and final completion of the Work, including Punch List Work, all in accordance with the Contract Documents, General Contractor shall tender an executed Certificate of Final Completion to NMHU substantially in the form attached hereto as **Exhibit D-2**, and shall submit a request for final payment in accordance with **Section 4.2.2, "Final Payment or Single Sum Payment."** NMHU or its contractors shall accept or reject General Contractor's determination of final completion in writing within ten (10) business days of General Contractor's certification. If NMHU rejects General Contractor's determination of final completion, the matter shall be resolved in accordance with the procedure set forth in **Section 10.1 "Substantial Completion."**

10.4 Title. General Contractor warrants and guarantees that title to and the ownership of the Work shall pass to NMHU, free and clear of any and all liens, claims, security interests and encumbrances, and General Contractor hereby conveys, transfers and assigns to NMHU all of General Contractor's right, title and interest in and to the Work, upon the earliest of (a) payment of the amount due covering such Work, notwithstanding amounts withheld, deducted or offset by NMHU in accordance with the terms of this Agreement, (b) Substantial Completion, or (c) the suspension, abandonment, or termination of this Agreement, in whole or in part. Transfer of title to the Work shall not affect the allocation of risk of loss or otherwise relieve General Contractor of its obligations, duties and responsibilities with respect to the Work.

10.5 Risk of Loss. Until NMHU takes possession and control of the Work pursuant to **Section 10.1** or upon termination of this Agreement or any Task Order, General Contractor hereby assumes the risk of loss for the Work, including, without limitation, any equipment and materials, whether on or off the Work site,

and all Work in progress. If any loss, damage, theft or destruction occurs to the Work for which General Contractor has so assumed the risk of loss, General Contractor shall, at its cost, promptly repair or replace such Work and the property affected thereby.

SECTION 11
DEFAULT AND TERMINATION

11.1 Default. General Contractor shall be deemed to be in default if at any time during the performance of the Work or prior to satisfaction of all obligations hereunder General Contractor shall:

(a) fail to prosecute the Work or any portion thereof with sufficient diligence to ensure Substantial Completion by the Required Substantial Completion Date and Final Acceptance by the Required Final Completion Date;

(b) become insolvent, fail or admit in writing its inability to pay its debts as they become due, or make a general assignment for the benefit of its creditors;

(c) file, or have filed against it, a petition under any bankruptcy, reorganization, arrangement, insolvency, readjustment of debt, dissolution or liquidation law of any jurisdiction, or have an attachment or execution levied upon a substantial part of its property or any of its property used hereunder, or have a receiver, trustee, custodian or liquidator appointed for a substantial part of its property or any of its property used hereunder or for its business;

(d) have any legal proceeding taken against it that in the opinion of NMHU interferes with the diligent and efficient performance and satisfactory completion of the Work;

(e) fail to replace or correct Work not in conformance with the Contract Documents;

(f) fail to supply qualified workers or proper materials or equipment;

(g) fail to maintain or enforce a drug and alcohol policy, with respect to its employees and Subcontractors involved in the Work;

(h) disregard or fail to comply with the Applicable Laws;

(i) fail, neglect, or refuse to proceed with the Work in a prompt, safe, tidy, and diligent manner;

(j) fail to pay promptly all monies due Subcontractors and suppliers, or others for materials, labor and services in connection with the Work;

(k) fail or refuse to provide documentation or reports or cooperate with an audit or inspection authorized or required by this Agreement;

(l) fail, neglect, or refuse to proceed according to and in full compliance with all the provisions and covenants of the Contract Documents;

(m) assign or attempt to assign this Agreement without obtaining NMHU's prior written consent; or

(n) breach any of its obligations, covenants, duties or responsibilities under this Agreement or breach any representation or warranty made to NMHU;

(o) fail to comply with all Public Works Minimum Wage Act and project requirements;

(p) fail to work closely and successfully coordinate work with other General Contractors hired directly by the university.

11.2 Notice of Default. If at any time General Contractor shall be deemed in default pursuant to **Section 11.1 "Default,"** NMHU may, at its election, give General Contractor notice in writing setting forth the particulars of such default and, at NMHU's option, among other remedies, may elect to terminate this Agreement and/or any Task Order issued hereunder in accordance with **Section 11.3 "Termination by NMHU for Cause."**

11.3 Termination by NMHU for Cause. In the event of a default by General Contractor and if NMHU elects to terminate this Agreement and/or any Task Order issued hereunder, then NMHU shall give written notice of termination to General Contractor specifying the date of termination. NMHU may, at its option, (a) take possession of the Work site and take possession of or use all materials, equipment,

tools, and construction equipment and machinery owned by General Contractor to maintain the orderly progress of, and to finish the Work; or (b) finish the Work by whatever other reasonable method determined by NMHU.

11.3.1 If the unpaid balance of the Task Order Sum under any Task Order terminated exceeds the cost of finishing the Work and any other extra costs or Damages incurred by NMHU in completing the Work, or otherwise as a result of General Contractor's default, such excess shall be paid to General Contractor. If such costs exceed the unpaid balance of the Task Order Sum under any Task Order terminated, General Contractor shall pay the difference to NMHU. These obligations for payment survive termination.

11.3.2 Termination of this Agreement and/or any Task Order issued hereunder in accordance with this Section shall not relieve General Contractor or its surety of any responsibilities for Work performed.

11.3.3 If NMHU terminates this Agreement and/or any Task Order issued hereunder for default under this Section and it is later determined that General Contractor was not in default, then such termination shall be deemed a termination for convenience pursuant to **Section 11.4 "Termination by NMHU for Convenience."**

11.4 Termination by NMHU for Convenience. NMHU may, upon advance written notice to General Contractor, suspend, abandon, or terminate this Agreement and/or any Task Order issued hereunder, or any portion of the Work, for any reason whatsoever, including for the convenience of NMHU without regard to whether or not General Contractor has defaulted or failed to comply with the provisions of the Contract Documents.

11.4.1 If NMHU terminates this Agreement and/or any Task Order issued hereunder, or any portion of the Work, for convenience, NMHU shall pay General Contractor for all parts of the Work done prior to the date of termination, including materials provided, in conformity with the Contract Documents, plus, without duplication, an amount equal to General Contractor's substantiated, reasonable direct costs necessarily incurred (i) in procuring materials and equipment as authorized by NMHU (but less all amounts refunded, whether through cancellation of purchase orders or otherwise) and in canceling purchase orders as instructed by NMHU, and (ii) in preparation for the parts of the Work not yet performed and in demobilizing and stopping work hereunder, provided that the total sum

payable to General Contractor upon termination shall not exceed the unpaid balance of the Task Order Sum. General Contractor shall not be entitled to any other costs or Damages whatsoever arising out of General Contractor's performance of the Work and the termination by NMHU for convenience of this Agreement and/or any Task Order issued hereunder. The remedy and measure of Damages set forth in this Section shall be the sole and exclusive remedy and measure of Damages for such termination, and General Contractor hereby waives, releases and discharges any and all other remedies, claims, Damages and losses, at law or in equity.

11.5 Stopping Work. When NMHU terminates Work in accordance with **Section 11.3 "Termination by NMHU for Cause"** or **Section 11.4 "Termination by NMHU for Convenience,"** General Contractor shall take the actions set forth below:

11.5.1 Unless NMHU directs otherwise, after receipt of a written notice of termination for either cause or convenience, General Contractor shall promptly (a) stop performing Work on the date and as specified in the notice of termination; (b) place no further orders or subcontracts for materials, equipment, services or facilities, except as may be necessary for completion of such portion of the Work that is not terminated; (c) cancel such existing orders and subcontracts as directed by NMHU, to the extent that they relate to the performance of Work terminated; (d) assign to NMHU all of the right, title, and interest of General Contractor in all orders and subcontracts relating to Work which shall continue; (e) deliver completed Work to NMHU and take such action as may be necessary or as directed by NMHU to preserve and protect the Work, Work site, and any other property related to the Work in the possession of General Contractor; and (f) continue performance of Work only to the extent not terminated.

11.6 Suspension of the Work. NMHU may, for any reason, at any time and from time-to-time, by written notice to General Contractor, suspend the carrying out of Work or any part thereof, whereupon General Contractor shall suspend the carrying out of the Work or any part thereof for such time or times and in such manner as NMHU may require. During any such suspension, General Contractor shall properly protect and secure the Work in such manner as NMHU may reasonably require. Unless otherwise instructed by NMHU, General Contractor shall, during any such suspension, maintain its staff and labor on or near the Work site and otherwise be ready to proceed with the Work upon receipt of NMHU's further instructions. NMHU and General Contractor shall negotiate a Change

Order, in accordance with **Section 5 "Changes in the Work"**, to address the impact of such suspension on the Task Order Sum and Period of Performance.

11.7 Termination by General Contractor for NMHU Default. Subject to NMHU's rights under **Section 4.2.1 "Progress Payments"** and **Section 4.8 "Set-offs,"** if NMHU fails to pay General Contractor any undisputed amount due hereunder, and such failure continues for thirty (30) days following receipt of written notice thereof from General Contractor, then General Contractor shall be entitled to suspend further performance of the Work and be paid its costs of mobilization and demobilization during the period of suspension in the same manner as provided in **Section 11.4.1** until the undisputed amount due has been paid. If (a) such failure continues for an additional period of thirty (30) days, (b) bankruptcy, insolvency or receivership proceedings, whether voluntary or involuntary, are commenced with respect to NMHU if such involuntary proceeding is not dismissed within sixty (60) days, or NMHU makes a general assignment of all or a substantial portion of its assets for the benefit of its creditors (other than collateral assignment), or (c) General Contractor's Work under a Task Order is delayed by an event of Uncontrollable Forces, and/or suspended by NMHU, for one hundred eighty (180) days or more, then General Contractor shall be entitled to terminate this Agreement or the applicable Task Order by written notice to NMHU, and be paid its costs in the same manner as provided in **Section 11.4.1**. The termination by General Contractor of this Agreement or the applicable Task Order, as the case may be, and payment of the costs specified, shall be the sole and exclusive remedy and measure of Damages for the events and circumstances described and termination of this Agreement or the applicable Task Order, and General Contractor hereby waives, releases and discharges any and all other remedies, claims, Damages and losses, at law or in equity.

11.8 Termination by General Contractor for Convenience. General Contractor may, upon thirty (30) day's prior written notice to NMHU terminate this Agreement, for any reason whatsoever including for the convenience of General Contractor without regard to whether or not NMHU has defaulted or failed to comply with the provisions of the Contract Documents. In the event of termination by General Contractor, NMHU may elect to require General Contractor to perform any or all Work required by any Task Order then outstanding. NMHU will pay General Contractor for Work performed and any reimbursable costs incurred in accordance with this Agreement prior to the effective date of termination and General Contractor shall deliver to NMHU all reports, drawings or other documents prepared or received in connection with the Work, and all applicable Work products completed for NMHU under this Agreement.

11.9 Delivery of Work. Upon the suspension, abandonment, or termination of this Agreement or any Task Order, in whole or in part, General Contractor shall execute and deliver all such instruments and take all such steps, including assignment of contracts and its contractual and intellectual property rights with third parties, as may be required to transfer possession and fully vest in NMHU all right, title, and interest in all Work, including but not limited to all plans, specifications, drawings, materials, and equipment and all contractual rights, and/or cancel or terminate, at NMHU's option, such of those contractual and intellectual property rights including, but not limited to, subcontracts and purchase orders as may be requested in writing by NMHU.

SECTION 12
DISPUTE RESOLUTION

12.1 Dispute Resolution. If the Parties are unable to resolve any dispute within thirty (30) days after written notice by one Party to the other Party of the occurrence of the event or circumstances giving rise to the dispute, the dispute may be submitted to mediation upon the mutual agreement of the Parties. In the event the Parties do not agree to mediate the dispute or are unable to resolve the dispute through mediation and the aggregate amount of the claim (including counterclaims) is less than One Hundred Thousand Dollars ($100,000), then the dispute shall be resolved by binding arbitration. Except as set forth herein, such arbitration shall be governed by the Commercial Rules of the American Arbitration Association, as amended from time to time. A Party demanding arbitration shall give the other Party timely notice of such election pursuant to **Section 7 "Representatives and Notices,"** with a copy to NMHU Vice President Finance & Administration, Rogers Administration Bldg., Las Vegas, New Mexico 87701, and such notice shall describe the nature of the dispute and the amount in controversy. The Parties shall then jointly select an arbitrator and failing such mutual agreement within ten (10) days after written notice demanding arbitration, the arbitrator shall be appointed by the Chief District Court Judge from Bernalillo County, New Mexico. The arbitration shall be held in Albuquerque, New Mexico. Discovery shall be by agreement of the Parties or as ordered by the arbitrator, provided that the Parties shall comply with the following minimum discovery requirements: at least ten (10) days prior to the arbitration, the Parties shall exchange copies of all exhibits to be used at the arbitration and a list of witnesses and a summary of the matters as to which each witness is expected to testify.

12.2 Disputes In Excess of $100,000. In the event the Parties do not agree to mediate the dispute or are unable to resolve the dispute through mediation, and the aggregate amount of the claim in dispute equals or exceeds One Hundred Thousand Dollars ($100,000), then the Parties may agree to submit the matter to binding arbitration under the Commercial Rules of the American Arbitration Association, as amended from time to time, and failing such agreement, either Party may bring an action in the federal or state courts of New Mexico.

12.3 Costs and Other Provisions. All costs of mediation or arbitration, including the fees of the mediator or arbitrator, shall be split equally by the Parties, except that the Parties shall be responsible for payment of their own attorney fees, expert fees, preparation fees, travel, and similar costs. This agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law of the State of New Mexico. Indemnity claims are not subject to mandatory arbitration. Nothing in this **Section 12** shall affect, restrict, condition, or otherwise limit a Party's right to terminate this Agreement pursuant to **Section 11 "Default and Termination."**

12.4 Payment of Undisputed Amounts; Other Remedies. When any dispute occurs, General Contractor shall continue the Work in accordance with the terms hereof and NMHU shall continue to make payments of undisputed amounts in accordance with this Agreement, and the Parties shall otherwise continue to exercise their rights, and fulfill their respective obligations, under this Agreement. While any consultations, mediation or arbitration is pending, neither Party shall exercise any other remedies hereunder arising by virtue of the matters in dispute; provided, however, NMHU's right to terminate under this Agreement shall not be suspended.

SECTION 13
LIABILITY

13.1 General Liability; Indemnification. To the fullest extent permitted by law, General Contractor shall indemnify, defend and hold harmless NMHU, and its directors, officers, employees, representatives, agents, advisors, and consultants, collectively **"Indemnified Persons,"** from and against any and all Damages asserted or awarded against or incurred by such indemnitees arising out of, resulting from or relating to the performance or non-performance of the Work or this Agreement, but only to the extent that the Damages are caused by, or arise out of, the acts or omissions of General Contractor, Subcontractor, or a supplier of General Contractor or Subcontractor, or anyone directly or indirectly employed or retained by them or anyone for whose acts they may be liable.

13.2 Liability for Property. General Contractor shall protect the Work and NMHU's property, including equipment and materials furnished by NMHU, from injury and risk of loss. General Contractor shall provide all facilities for protection required by public authority or local authority or Applicable Law. General Contractor shall be liable to NMHU for any loss of or damage to the property of NMHU resulting from performance or non-performance of the Work or this Agreement.

13.3 Trespass. General Contractor shall be solely responsible for any act of trespass or any injury to adjacent property, resulting from or in connection with performance or non-performance of the Work or this Agreement. General Contractor shall be liable for any Damages that may arise from the deposit of debris of any kind upon adjacent property.

13.3.1 Rights-of-Way and Leased Property. In connection with all Work to be performed hereunder on rights-of-way granted to NMHU or property leased by NMHU, General Contractor shall comply with all requirements of the rights-of-way or lease agreements applicable to the Work to be performed hereunder. General Contractor shall not be responsible for requirements arising after Final Acceptance. The requirements of the rights-of-way and lease agreements granted to NMHU are available for inspection and copying by General Contractor. All of such requirements are incorporated by reference and a part of this Agreement for all purposes and, in the event of any conflict thereof with other provisions of this Agreement, the rights-of-way requirements or lease agreements shall control. When Work is performed on lands where rights-of-way requirements are applicable, NMHU shall designate all rights-of-way areas when requested in writing by General Contractor.

13.4 Compliance with Laws. General Contractor shall comply with all Applicable Laws. General Contractor shall indemnify, defend, and hold harmless the Indemnified Persons from and against any and all Damages asserted or awarded against or incurred by such indemnitees arising out of, resulting from or relating to the violation by General Contractor of any Applicable Laws.

13.5 Liens. General Contractor shall at all times promptly pay for all materials, equipment, services and labor used in the performance of the Work and shall maintain all Work, materials, equipment, structures, premises, and other property free and clear from all liens, security interests, attachments and other

encumbrances created by, through or under, or as a result of any act or omission (or alleged act or omission) of, General Contractor or any Subcontractor, or other Person providing materials, equipment, services or labor in the performance of the Work, including, without limitation, common law, contractual, statutory and constitutional mechanic's liens, materialman's liens and labor liens (**"Liens"**). General Contractor shall discharge at once, or bond or otherwise secure against, all Liens which are filed or claimed and shall indemnify, defend and hold harmless NMHU, and if applicable the owners of the premises on which the Work is performed, from and against any and all Damages asserted or awarded against or incurred by such indemnitees arising out of, resulting from, or relating to, such Liens. General Contractor shall provide NMHU, upon its request, with reasonable evidence (including executed Lien waivers in the forms attached as **Exhibits C-1 and C-2**) showing that all materials, equipment, labor, and Subcontractors and suppliers have been paid in full.

13.6 Intellectual Property Rights Infringement Indemnity. General Contractor warrants that none of the Work (including services provided hereunder), or the results thereof, performed by General Contractor, or any Subcontractor, or the documents, drawings, goods or equipment produced, designed, fabricated, delivered, or assembled by General Contractor, or any Subcontractor, pursuant to this Agreement, infringe upon or violate any patent, copyright, trade secret, or any other intellectual or property rights of any third party. If any third party makes a claim or commences a proceeding against NMHU alleging such an infringement or violation, General Contractor shall indemnify, defend and hold harmless the Indemnified Persons from and against any and all Damages asserted or awarded against or incurred by such indemnitees. NMHU will notify General Contractor if any such claim is made or proceeding is commenced. If the use of any of the Work, or the results of such Work, or documents, goods, or equipment, or any part thereof furnished under this Agreement, is held in any such claim or proceeding to constitute an infringement and/or is enjoined, whether temporarily or permanently, General Contractor shall at its sole cost and expense, either:

(a) procure for NMHU the right to use the Work or results of such Work or such documents, goods and equipment; or

(b) replace the Work or the results of such Work or such documents, goods, or equipment with non-infringing Work, documents, goods or equipment having the equivalent functionality as the infringing or allegedly infringing Work, documents, goods or equipment; or

(c) modify such Work, documents, goods, or equipment so as to make them non-infringing, but equivalent in functionality.

13.7 Best Efforts. General Contractor shall use its best efforts to obtain for the benefit of NMHU identical intellectual property indemnification protection in all subcontracts, purchase orders, and other agreements entered into under this Agreement. The requirements of this Section 13.7 are not intended to abridge, abrogate, amend, or otherwise affect General Contractor's obligations under **Section 13.6 "Intellectual Property Rights Infringement Indemnity."**

13.8 Third Party Claims. General Contractor shall keep the Indemnified Person informed as to the status and progress of third party claims, actions, suits or proceedings. The Indemnified Person shall have the right to be represented by its own counsel and such counsel may participate in such claim, action, suit or proceeding, and the fees and expenses of such counsel shall be reimbursed by General Contractor. General Contractor shall not agree to or conclude any settlement that affects the Indemnified Person without the prior written approval of the Indemnified Person.

SECTION 14
DRUG, ALCOHOL, SAFETY AND HAZARDOUS MATERIALS

14.1 Drug and Alcohol Policy.

14.1.1 General Contractor, in the performance of any Work requiring the physical presence of its employees on NMHU's property or on the property of others for which NMHU has acquired access rights, shall maintain a drug and alcohol policy, with respect to its employees and SubGeneral Contractors involved in the Work, which policy at a minimum includes reasonable cause and post-accident testing procedures and which advances the policy of providing a work environment that is free from the use, consumption, possession, sale, or distribution of illegal drugs or alcohol, and from the misuse of legal drugs on NMHU's premises and Work sites, including General Contractor vehicles used on NMHU property or Work sites.

14.1.2 General Contractor shall comply with all Applicable Laws concerning drug and alcohol use, including, if applicable, requirements of the United States Department of Transportation. General Contractor shall require that each SubGeneral Contractor complies with the drug and alcohol policy

requirements and Applicable Laws as set forth herein and, upon request by NMHU, will provide to NMHU verification of General Contractor's and SubGeneral Contractor's compliance with such policy requirements and Applicable Laws.

14.1.3 NMHU may remove a General Contractor's employee from any Work or Work site if NMHU reasonably suspects the employee is under the influence of controlled substances or alcohol until such time as General Contractor confirms by testing that the employee is fit for duty.

14.2 Safety Materials. General Contractor agrees and warrants that all materials, supplies, equipment and/or services provided in connection with the Work meet the safety standards established and promulgated under the Federal Occupational Safety and Health Act of 1970, 29 U.S.C.A. § 651, *et seq.*, and, if applicable, the Federal Motor Carrier Safety Acts, or under any Applicable Law of a state in lieu thereof, for the protection of employees who will be affected by the use or performance of said materials, supplies, equipment and/or services. General Contractor shall comply with all Applicable Laws governing safety and the safe operation of commercial motor vehicles and the safe performance of the Work.

14.3 Safety Precautions. General Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs concerning the performance of the Work in accordance with all Applicable Laws. General Contractor shall provide and be directly responsible for its own safety program for its employees and for the safe operation of its and its SubGeneral Contractor's vehicles and equipment.

14.3.1 General Contractor's Responsibilities. In carrying out its responsibilities according to the Contract Documents, General Contractor shall (a) protect the lives and health of persons performing the Work and other persons who may be affected by the Work; and shall erect and maintain all necessary safeguards for such safety and protection; (b) prevent damage to materials, supplies, and equipment whether on the Work site or stored off the Work site; (c) prevent damage to other property at the Work site or adjacent thereto; and (d) notify NMHU's Task Order Supervisor when prosecution of the Work may affect adjacent properties and any above ground and underground utilities.

14.3.2 Accident Reporting. In case of an accident involving General Contractor or the Work, an investigative report shall be prepared by General

Contractor and one copy thereof given to NMHU within twenty-four (24) hours of the occurrence of the accident. Verbal notification of any fatal injury, or serious injury that may require overnight hospitalization, shall be provided within one (1) hour of the injury.

14.4 Hazardous Materials

14.4.1 No Hazardous Materials to Be Brought on to Work Site. General Contractor shall not, nor shall it permit or allow any Subcontractor or supplier to bring any Hazardous Materials on the Work site and or release or dispose of any Hazardous Materials at the Work site; provided, however, that General Contractor may bring onto the Work site such Hazardous Materials as are necessary to perform the Work so long as the same is done in compliance with Applicable Laws. General Contractor shall remain responsible and strictly liable for all Hazardous Materials brought on to or generated at the Work site, including, without limitation, the management, transportation, storage, labeling, treatment and disposal of all such Hazardous Materials. General Contractor shall notify NMHU prior to bringing any Hazardous Materials onto the Work site and shall provide NMHU, on site, the following information with respect to any Hazardous Materials: (a) material safety data sheet; (b) quantity (volume/mass); (c) length of time on site; (d) container type; and (e) disposal location if disposed or otherwise managed. General Contractor shall require all Subcontractors and suppliers to provide the information required under this subsection to NMHU prior to bringing any Hazardous Materials to the Work site. General Contractor shall exclude the use of lead paint and minimize the use of acetone and chlorinated solvents and similar substances at the Work site, and shall require all Subcontractors and suppliers to do likewise.

14.4.2 Discovery of Hazardous Materials. If General Contractor encounters any Hazardous Material in or on the Work site (other than Hazardous Materials brought to the Work site by General Contractor or Subcontractor) which creates an imminent or substantial safety or health hazard for NMHU, General Contractor, any Subcontractor or their respective employees, agents or representatives, or the general public or the surrounding environment, General Contractor shall suspend the performance of the Work to the extent required to avoid any such safety or health hazard until action sufficient to protect the interests of such parties is taken by NMHU or taken by General Contractor when authorized by NMHU (by Change Order) to take such action. General Contractor shall notify NMHU

immediately upon encountering any Hazardous Materials in or on the Work site and shall thereafter suspend all Work on the impacted area of the Work and follow the directions of NMHU, which directions shall be in accordance with Applicable Laws.

14.4.3 General Contractor's Responsibility. General Contractor shall be responsible for the handling, management, treatment, labeling, storage, removal, remediation, avoidance, or other appropriate action (if any), with respect to any Hazardous Materials present at, on, in or under, or migrating and/or emanating to or from the Work site, that (a) were brought or caused to be brought on the Work site, were generated at the Work site or were released to the environment by any act or omission of General Contractor or any Subcontractor; (b) were handled, treated or stored at the Work site by General Contractor or any Subcontractor in violation of Applicable Laws; or (c) were the result of any willful, negligent or unlawful act or omission of General Contractor or any Subcontractor.

14.4.4 Indemnification. To the fullest extent permitted by law, General Contractor shall indemnify, defend and hold harmless NMHU its directors, officers, employees, representatives, agents, advisors, and consultants from and against any and all Damages asserted or awarded against or incurred by such indemnitees arising out of, resulting from or relating to the existence, handling, treatment, storage, removal, remediation, avoidance or other action, or the pollution or contamination from, or any violation of Applicable Law relating to, any Hazardous Materials that (a) were brought or caused to be brought on the Work site, were generated at the Work site, or were released to the environment by any act or omission of General Contractor or any Subcontractor; (b) were handled, treated, stored or disposed of at the Work site by General Contractor or any Subcontractor; or (c) were the result of any willful, negligent or unlawful act or omission of General Contractor or any Subcontractor.

SECTION 15
INSURANCE AND BONDS

15.1 General Contractor's Insurance. Prior to commencement of the Work, General Contractor shall obtain the insurance required by the Contract Documents and all insurance that may be required under the Applicable Laws. General Contractor shall require its insurers to name NMHU and its directors, officers, managers, representatives, agents and employees as additional insureds, to the

extent allowable, under such policies. Unless otherwise indicated below, each insurance policy of General Contractor shall provide, either in its printed text or by endorsement, that it shall be primary with respect to the interest of NMHU, and any other insurance maintained by NMHU is in excess and not contributory to General Contractor's insurance policies in all instances regardless of any like insurance coverage that NMHU may have. Unless otherwise indicated below, each insurance policy of General Contractor shall be written on an occurrence basis. General Contractor shall furnish to NMHU a completed certificate of insurance coverage which references this Agreement number and which specifically requires thirty (30) days prior written notice to NMHU of cancellation, termination, non-renewal, or any material change of any such insurance policy. If General Contractor fails to obtain and keep in force the insurance required hereunder, NMHU may obtain and maintain the required insurance in the name of General Contractor and the cost thereof shall be payable by General Contractor to NMHU on demand. Review of General Contractor's insurance by NMHU shall not relieve or decrease the liability of General Contractor. Nothing in this Agreement shall be deemed to limit General Contractor's liability under this Agreement to the limits of the insurance coverages required hereunder. General Contractor shall be solely responsible for payment of all deductible or retention amounts pertaining to any insurance required hereby.

15.2 Minimum Coverage. Without limiting any of the liabilities or other obligations of General Contractor under this Agreement, including but not limited to **Section 13 "Liability,"** General Contractor shall obtain and maintain in effect, at its sole cost and expense, with forms and insurers acceptable to NMHU, until all the obligations under this Agreement or any Task Order are satisfied, insurance policies providing coverage protecting against claims for personal and bodily injury or death, as well as claims for property damage which may arise from operations in connection with the Work whether such operations are by General Contractor or any Subcontractor for at least the following minimum coverage:

(a) **Worker's Compensation Insurance**, to cover obligations imposed by federal and state statutes pertaining to General Contractor's employees engaged in the performance of any services and Employer's Liability Insurance with a minimum limit of One Million Dollars ($1,000,000).

(1) Alternate Employer Endorsement. General Contractor's Worker's Compensation and Employer's Liability insurance policies shall be endorsed with the "Alternate Employer Endorsement" to

extend coverage under such policies to NMHU as an alternate employer. **[Note: This section is applicable to situations where NMHU is using temporary or contract crews/employees, leasing employees, renting equipment with operators, provision of workers to a joint venture, provision of employees by a building management company for services to a building owner.]**

(b) **Commercial General Liability Insurance**, or the equivalent, with a minimum limit of Two Million Dollars ($2,000,000) per occurrence. The policy shall include coverage for bodily injury liability, broad form property damage liability, blanket contractual, General Contractor's protective, products liability and completed operations. Where applicable, the policy shall include coverage for the hazards commonly referred to as "XCU." The policy shall be endorsed to include NMHU as an additional insured only to the extent NMHU is vicariously liable for the negligence, acts or omissions of General Contractor.

(c) **Business Automobile Liability Insurance**, or the equivalent, with limit of not less than One Million Dollars ($1,000,000) per accident with respect to General Contractor's vehicles whether owned, hired, or non-owned, assigned to or used in the performance of any Work required to be performed by General Contractor pursuant to the Contract Documents.

(d) **Builder's Risk.** If required by any ITA, General Contractor shall provide standard form "All Risk" Builder's Risk or Installation Insurance covering One Hundred Percent (100%) replacement value of property built or installed.

(e) **Errors and Omissions/Professional Liability.** If required by any Task Order, General Contractor shall provide Errors and Omissions/Professional Liability insurance with a minimum limit of Two Million Dollars ($2,000,000). This insurance shall be written on a claims-made or occurrence basis. If written on a claims-made basis, General Contractor agrees to maintain Errors and Omissions/Professional Liability insurance for at least three (3) years after this Agreement is terminated. **[Note: Use with professional services (*e.g.*, architectural-engineering) contracts.]**

(f) **Umbrella/Excess Liability Insurance** liability coverage with minimum limits of liability of Ten Million Dollars ($10,000,000) per occurrence and Ten Million Dollars ($10,000,000) policy aggregate. Insurance coverages and limits required herein should not in any way limit the extent of General Contractor's responsibilities and liabilities specified elsewhere in this Agreement or those specified by law.

(g) **General Contractor's Pollution Liability Insurance**, or the equivalent, if required by any Task Order, with a minimum limit of Ten Million Dollars ($10,000,000) per occurrence and Ten Million Dollars ($10,000,000) annual aggregate. The policy shall include coverage for pollution losses, including but not limited to bodily injury, property damage, and financial loss arising out of General Contractor's operations and completed operations and for sudden and gradual pollution arising out of General Contractor's performance under this Agreement. **[Note: May not be applicable to all situations.]**

15.3 Waiver of Subrogation. General Contractor waives all rights against NMHU and its consultants, and their respective directors, officers, managers, representatives, agents and employees, for damages caused by fire or other causes of loss to the extent covered by insurance obtained pursuant to this Agreement or other insurance applicable to the Work. All insurance policies in any way related to the Work and secured and maintained by General Contractor shall include clauses stating each underwriter waives all rights of recovery, by subrogation or otherwise, against NMHU and its directors, officers, managers, representatives, agents and employees, and any right of the insurers to Set-off or counterclaim, offset or any other deduction, whether by attachment or otherwise, in respect of any liability or any such Person insured under such policy.

15.4 Subcontractors. General Contractor shall require that each Subcontractor comply with the insurance requirements set forth in **Section 15.2 "Minimum Coverage."** Before permitting any of its Subcontractors to perform any Work at the site, General Contractor shall obtain a certificate of insurance from each such Subcontractor evidencing that such Subcontractor has obtained the required insurance. All policies of Subcontractors shall include a waiver of any right of subrogation of the insurers thereunder against General Contractor and NMHU and its directors, officers, managers, representatives, agents and employees, and any right of the insurers to Set-off or counterclaim, offset or any other deduction,

whether by attachment or otherwise, in respect of any liability or any such Person insured under such policy.

15.5 Payment and Performance Bonds. If requested by NMHU, General Contractor shall furnish in connection with the performance of the Work under a Task Order, in a form acceptable to NMHU executed by a surety company satisfactory to NMHU and which satisfies all requirements of Applicable Laws, a payment bond for the protection of Persons furnishing labor and materials and a performance bond for the protection of NMHU that assures full and faithful performance of General Contractor in payment of all obligations hereunder. The penal sum of each bond shall be equal to the Fixed Price or, if paid on a time and materials basis, the Ceiling Price referenced in the Task Order. Bonds shall be dated as of the date of the applicable Task Order and shall be furnished promptly by General Contractor to NMHU, accompanied by a certified copy of the "Power of Attorney" document issued by the surety company. General Contractor shall notify the surety of any changes affecting the general scope of the Work or change in the Task Order Sum and the amount of the applicable bonds shall be adjusted accordingly. General Contractor shall furnish proof of such adjustment to NMHU upon request.

SECTION 16
OTHER PROVISIONS

16.1 Proprietary Information and NMHU Equipment.

16.1.1 All models, maps, drawings, specifications, methods, technical data, computer coding and programs, trade secrets, other documents and information, including, without limitation, business or financial information, furnished to General Contractor by NMHU or prepared by General Contractor or any Subcontractor in connection with this Agreement are confidential and proprietary to NMHU, are and shall remain the property of NMHU, cannot be copied or otherwise reproduced or used in any way, except as necessary, in connection with the performance of the Work, and cannot be disclosed to any third party or used in any manner detrimental to the interests of NMHU.

16.1.2 Any equipment provided to General Contractor by NMHU shall remain the property of NMHU and General Contractor will use the same degree of care to protect NMHU's equipment as General Contractor would use to protect its own equipment, but in no event with less than the degree of

care that a prudent business reasonably would use to protect its own equipment. General Contractor shall be responsible for any loss or damage to any equipment provided to General Contractor by NMHU.

16.1.3 General Contractor shall insert in any subcontract or purchase order issued under this Agreement, restrictions on the use of such equipment, models, drawings, specifications, technical data, trade secrets and other documents, as provided herein.

16.1.4 The obligations contained in this Section will survive the expiration or termination of this Agreement.

16.2 Intellectual Property.

16.2.1 Intellectual Property Rights. General Contractor agrees that all inventions, works of authorship and other proprietary data, and all other materials (as well as the copyrights, patents, trade secrets, and similar rights attendant thereto) conceived, reduced to practice, authored, developed or delivered by General Contractor or any Subcontractor and their respective employees, agents, consultants, General Contractors, and representatives either solely or jointly with others, during and in connection with the performance of the Work under this Agreement (including the performance of services provided hereunder) or the results thereof, shall be owned by NMHU (**"Intellectual Property"**). Neither General Contractor nor any Subcontractor nor their respective employees, agents, consultants, General Contractors or representatives shall have the right to disclose or use any of the Intellectual Property for any purpose whatsoever or to communicate to any third party the nature of or details relating to the Intellectual Property. General Contractor hereby grants, assigns and conveys to NMHU all right, title, and interest in and to the Intellectual Property. General Contractor agrees that it will not seek, and that it will require each Subcontractor and all of General Contractor's and its Subcontractors' employees, agents, consultants, General Contractors, and representatives not to seek, patent, copyright, trademark, registered design, or other protection for any rights in any of the Intellectual Property. General Contractor agrees that it shall do, and that it will require its Subcontractors and all of General Contractor's and its Subcontractors' employees, agents, consultants, General Contractors, and representatives to do, at NMHU's expense, all things and execute all documents as NMHU may reasonably require to vest in NMHU or its nominees the rights referred to herein and to secure for NMHU or its

nominees all patent, trademark, or copyright protection, including but not limited to, assisting in preparing applications, signing all necessary documents, testifying in court proceedings, and retaining secret information concerning any of the Intellectual Property that is not public knowledge. General Contractor warrants and represents that it has or will have the right, through written agreements with its employees, to secure for NMHU the rights called for in this Section. Further, in the event General Contractor uses any Subcontractor, consultant, or other third party to perform any of the Work (including any services) under this Agreement, General Contractor agrees to enter into and provide to NMHU such written agreements with such third party, and to take such other steps as are or may be required to secure for NMHU the rights called for in this Section. General Contractor further agrees to provide the names and addresses of all agents, General Contractors, consultants, representatives, or other third parties who are involved in the performance of any of the Work (including any services) on behalf of General Contractor under this Agreement.

16.2.2 License of Pre-Existing Intellectual Property. General Contractor hereby grants to NMHU a fully paid and non-exclusive irrevocable perpetual license to use and copy, and to create derivative works of, any pre-existing copyrighted, patented and/or proprietary work that is incorporated into the Work (including services provided hereunder) or the results thereof, or into the documents, drawings, goods or equipment produced, designed, fabricated, delivered or assembled by General Contractor or any Subcontractor pursuant to this Agreement, including the right to create sub-licenses without any duty to account to General Contractor or any Subcontractor. If so requested by NMHU, General Contractor and Subcontractor shall cooperate with NMHU in executing all such assignments, oaths, declarations and other documents as may be prepared by NMHU to effect and evidence the foregoing. General Contractor agrees to enter into and provide to NMHU such written agreements with such third party, and to take such other steps as are or may be required to secure for NMHU the rights called for in this Section.

16.2.3 Survival of Obligations. General Contractor's obligations under this Section shall survive expiration or termination of this Agreement and any amendments hereto.

16.3 Special Environmental Provisions.

16.3.1 As required and scheduled by NMHU, General Contractor's employees shall attend environmental awareness and compliance training. General Contractor shall be entitled to compensation at the applicable rate for each employee in attendance.

16.3.2 During Work execution, General Contractor shall notify NMHU, prior to proceeding with any work, when any of the following events occur:

(a) Changes to the equipment being used, other than that specified in the Task Order, if any;

(b) Land restrictions (access) that develop (such as forest closures) after the job has started;

(c) Discoveries, including cultural (i.e., artifacts, archeological sites, human bones, histories, etc.), biological resources (including active nests with birds/young/eggs), that would be disturbed by the performance of work and any other conditions that might arise (such as fresh disturbance by a non-NMHU party).

16.3.3 No blading, grading or excavation of any land, including NMHU right-of-way, shall take place without prior approval by NMHU.

16.3.4 No disturbance of topsoil outside of the area necessary to perform a partial or full excavation and remedial treatment shall take place without prior approval from NMHU.

16.4 EEO Clauses. NMHU is an equal opportunity employer. If applicable, the Parties hereby incorporate and agree to abide by the requirements set forth in 41 CFR §§ 60-1.4(a), 60-1-4(b), 60-250.5(a) and 41 CFR 60-741.5(a).

16.5 Binding Effect; Assignment. This Agreement and all provisions hereof shall inure to and be binding upon the respective Parties, their successors, and permitted assigns. Since General Contractor was selected to perform the Work covered by this Agreement based on its professional qualifications, among other considerations, General Contractor shall not assign this Agreement or any part hereof, or any of its rights or obligations hereunder, without the prior written

consent of NMHU, which consent may be withheld if NMHU, in its sole opinion, considers that it is not in its best interests, economic or otherwise, to do so. NMHU shall have the right to assign the Agreement or any part of, or right or obligation under, this Agreement without General Contractor's consent. NMHU shall promptly notify General Contractor in writing of any such assignment, unless such assignment is to another governmental entity. In the event NMHU assigns this Agreement or any portion of, or right or obligation under, this Agreement to another governmental entity, NMHU shall be relieved of all financial responsibility related to the Agreement or portion of this Agreement so assigned.

16.6 Independent General Contractor. In performing the Work, General Contractor is acting and shall be deemed for all purposes to be an independent General Contractor. NMHU and General Contractor are not partners, agents or joint venturers with each other, and this Agreement is not intended to nor shall it be construed to create a partnership, joint venture, or agency relationship between NMHU and General Contractor. General Contractor shall complete the Work according to General Contractor's own means and methods of Work, which shall be in the exclusive charge and control of General Contractor, and which shall not be subject to the control and supervision of NMHU, except as to the results of the Work. General Contractor shall be entirely and solely responsible for its acts and the acts of its employees, Subcontractors and agents while engaged in the performance of the Work. General Contractor, its employees and agents shall not hold themselves out as employees or agents of NMHU. General Contractor and its employees are hereby expressly precluded from and not entitled to any employee benefits from NMHU. For the purpose of clarifying the ineligibility of General Contractor under NMHU's employee benefits plans or programs, General Contractor and its employees are hereby specifically excluded from any eligibility.

16.7 Reservation of Rights. Notwithstanding any other provisions to the contrary, General Contractor shall provide workers qualified and specialized, if required, in the Work to which they are assigned. General Contractor, at NMHU's request, shall perform security and background checks, as well as drug and alcohol tests, for the purpose of determining a worker's suitability for the assignment. NMHU reserves all rights to deny placement of any of General Contractor's or its Subcontractor's workers on NMHU premises, property, equipment, Work sites or projects at its sole discretion. Such denial of placement of subject workers shall be conveyed subject to the provisions of **Section 7.3 "Notices and Invoices"** and/or consistent with the normal custom between NMHU and General Contractor.

16.8 Subcontracts. General Contractor may, after notice of its intent to do so and unless objected to by NMHU, enter into subcontracts for the performance of parts of the Work. The issuance of subcontracts shall not relieve General Contractor of any of its obligations under the Contract Documents, including, among other things, the obligation to properly supervise and coordinate the Work of Subcontractors. Said subcontracts shall contain such provisions as are required by the Contract Documents or are reasonably necessary to ensure compliance by Subcontractors with the Contract Documents, or as NMHU may prescribe. General Contractor shall be solely liable for the acts, omissions and liabilities of, and performance and/or nonperformance of Work in accordance with the terms of this Agreement by, its Subcontractors. In addition to compliance with the provisions of **Section 15.2 "Minimum Coverage,"** General Contractor shall ensure that all Subcontractors comply with the provisions of **Section 14 "Drug, Alcohol, Safety and Hazardous Materials"** and **Sections 16.4 and 16.5, "EEO Clauses"** and **"Binding Effect; Assignment,"** respectively. References to General Contractor herein shall be deemed to include a reference to Subcontractors where applicable. However, nothing contained in any subcontract shall create a contractual relationship between any Subcontractor and NMHU. All contracts with Subcontractors shall be in writing and shall provide that the rights thereunder are assignable to NMHU or its designees. General Contractor shall promptly provide copies of the contracts with Subcontractors upon request by NMHU.

16.9 Taxes. General Contractor shall pay all taxes and contributions for unemployment insurance, old age retirement benefits, pensions, annuities, and similar benefits, which may now or thereafter be imposed on General Contractor by Applicable Law or collective bargaining agreements with respect to persons employed by General Contractor for performance of the Work. General Contractor shall be liable for and shall pay and shall indemnify, defend, and hold harmless NMHU and its directors, officers, employees, representatives, agents, advisors, and consultants from and against any and all such taxes and contributions or any interest accrued and penalties imposed, and reasonable attorney fees (including, but not limited to, income, margin, franchise, withholding, gross receipts, compensating, sales, use, property and all other taxes of whatsoever kind and whatsoever nature), excises, assessments, and other charges levied by any governmental agency or authority on General Contractor with respect to or because of the Work, or on any materials, equipment, supplies, services, or labor furnished in the performance of the Work. On all invoices or progress payment invoices, General Contractor shall separately show all New Mexico gross receipts, compensating, sales, and other similar taxes charged to NMHU, provided that in no event shall interest or penalties on such taxes be reimbursable by NMHU. General

Contractor shall also separately itemize services performed outside the State of New Mexico. General Contractor shall utilize appropriate New Mexico Nontaxable Transaction Certificates, or similar certificates from other states, where applicable, to minimize such gross receipts, compensating, sales, and other similar taxes. If the sale of goods or performance of services by General Contractor takes place on tribal land, General Contractor will comply with applicable state and tribal laws governing the reporting and payment of gross receipts taxes on those transactions.

16.10 Uncontrollable Forces. Neither Party shall be considered to be in default in respect to any obligation hereunder, if delays in or failure of performance shall be due to Uncontrollable Forces. Neither Party shall, however, be relieved of liability for failure of performance if such failure is due to removable or remediable causes which it fails to remove or remedy with reasonable dispatch. Nothing contained herein, however, shall be construed to require either Party to prevent or settle a strike or other labor dispute against its will. The Party whose performance hereunder is so affected shall immediately notify the other Party of all pertinent facts and take all reasonable steps to promptly and diligently prevent such causes if feasible to do so, or to minimize or eliminate the effect thereof without delay. General Contractor shall make no claim and hereby waives, releases and discharges any and all claims for additional compensation or Damages by reason of any delay or additional Work due to an Uncontrollable Force.

16.11 No Waiver. No delay, failure or refusal on the part of a Party to exercise or enforce any right under this Agreement shall impair such right or be construed as a waiver of such right or any obligation of the other Party, nor shall any single or partial exercise of any right hereunder preclude other or further exercise of any right. The failure of a Party to give notice to the other Party of a breach of this Agreement shall not constitute a waiver thereof. Any waiver of any obligation or right hereunder shall not constitute a waiver of any other obligation or right, then existing or arising in the future. To be effective, a waiver of any obligation or right must be in writing and signed by the Party waiving such obligation or right.

16.12 Gratuities and Anti-Kickback Provisions.

16.12.1 General Contractor shall not, under any circumstances, extend any gratuity or special favor to employees of NMHU that might be reasonably construed as an attempt to influence the recipients in the conduct of their official duties.

16.12.2 General Contractor agrees to abide by the Anti-Kickback Act of 1986, 41 U.S.C.A. § 51, *et seq.*, which prohibits any person from (1) providing, attempting to provide or offering to provide any kickback; (2) soliciting, accepting, or attempting to accept any kickback; or (3) including, directly or indirectly, the amount of any kickback in the cost of work charged to NMHU by the General Contractor. It is also agreed that General Contractor will not engage the services of any individual who has been convicted after September 29, 1988, or for a period of five (5) years after the date of conviction, of fraud or any other felony arising out of a contract with the Federal Government. Such person(s) is(are) prohibited from working in a management or supervisory capacity, serving as a consultant, or serving on the board of directors.

16.13 Employment Eligibility Verification. If required by a Task Order issued under this Agreement, the requirements of Section 48 C.F.R. 52.222-54 of the Federal Acquisition Regulations concerning Employment Eligibility Verification (**"E-Verify"**) requirements are hereby incorporated by reference. In addition, General Contractor and its Subcontractors shall include this provision in all subcontracts and comply with all E-Verify requirements.

16.14 Severability. If a court or regulatory agency having jurisdiction over the Parties determines that a condition of this Agreement, or any part thereof, including any Task Order, is void, illegal or unenforceable, said condition or part shall be deemed to have been severed from this Agreement, and the remaining conditions, or parts, shall be unaffected and shall be enforced to the fullest extent allowed by Applicable Law. Furthermore, in lieu of such illegal, invalid or unenforceable provision, there shall be added automatically as a part of this Agreement a provision as similar in its terms to such illegal, invalid or unenforceable provision as may be possible and be legal, valid and enforceable.

16.15 Governing Law and Venue. The entire relationship of the Parties, this Agreement, any remedies of the Parties, and any litigation or legal proceedings (whether grounded in tort, contract, statutory, equitable, or other law) between, involving, or arising among, the Parties, shall be governed by, interpreted in accordance with, and construed consistent with, the laws of the State of New Mexico, without regard to the choice of law principles which may otherwise dictate the application of the laws of another state. Any lawsuit or other legal proceeding (whether at law or in equity) between, involving, or arising among the Parties, or relating to this Agreement, shall be commenced and pursued solely in the Fourth Judicial District Court located in Las Vegas, NM or the Federal District

Court located in Albuquerque, New Mexico, and the Parties hereby waive any challenge they may have to the jurisdiction of such courts, consent to jurisdiction and venue in such courts, and relinquish any right to seek a change of venue or forum for any reason, including the alleged inconvenience of the venue or forum.

16.16 Fair Labor Standards Act. General Contractor warrants that any products purchased pursuant to this Agreement have been produced, and that all Work and all wages, hours and other forms or compensation have been provided, in compliance with the requirements of the Fair Labor Standards Act of 1938, 29 U.S.C.A. § 201, *et seq.,* as amended, and regulations and orders pursuant thereto issued by the U.S. Department of Labor.

16.17 Utilization of Small Disadvantaged Businesses. NMHU is a supplier of services to the federal government, and as such, must include the following flow down provisions in its contracts that exceed Five Hundred Fifty Thousand Dollars ($550,000). General Contractor shall comply with all the requirements of FAR 52.219-9(d)(9) entitled "Utilization Of Small Business Concerns And Small Disadvantaged Business Concerns." General Contractor shall: (i) cooperate in any studies or surveys as may be required by NMHU or the government; (ii) submit periodic reports as requested by NMHU providing information regarding its use of small disadvantaged businesses; and (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or (SF) 295, Summary Subcontract Reporting in accordance with instructions on the forms; and any requirements in addition thereto.

16.18 Counterparts. This Agreement and all other Contract Documents may be executed in any number of counterparts, each of which so executed shall be deemed to be an original, but all such counterparts shall together constitute but one and the same instrument. NMHU and General Contractor may retain a duplicate copy (e.g., electronic imager, photocopy, facsimile) of this Agreement, which shall be considered an equivalent to this original.

16.19 Entire Agreement. The Contract Documents represent the entire Agreement and understanding between NMHU and General Contractor with respect to the subject matter hereof and performance of the Work, and supersede any prior understandings, representations or agreements, whether verbal or written, prior to execution of this Agreement. If any Work was performed by General Contractor under verbal agreement or under a limited notice to proceed prior to the execution of this Agreement, then this Agreement shall apply thereto in the same manner as if made before such Work was performed.

16.20 Amendments. This Agreement may not be amended except by a writing signed by duly authorized representatives of all Parties hereto.

16.21 Agreement Authors. The Parties have agreed to this Agreement and no ambiguity shall be construed against any Party based on the identity of the author or authors of this Agreement.

16.22 Survival of Obligations. General Contractor's warranty obligations, including those under **Section 6 "Warranty, Inspection and Audit,"** indemnity obligations, including those under **Section 4 "Compensation," Section 8 "Work Site," Section 13 "Liability," Section 14 "Drug, Alcohol, Safety and Hazardous Materials,"** and **Section 16 "Other Provisions,"** and representations, including those under **Section 9 "General Contractor's Representations"** under this Agreement, and all other warranty and performance obligations, guaranties, representations, and indemnity obligations in the Contract Documents shall survive any termination of the Agreement (in whole or in part), or the suspension, completion and/or acceptance of the Work (or any part thereof), or final payment to General Contractor, it being agreed that said obligations and rights are and shall be of a continuing nature. In addition, the rights and obligations of the Parties under **Section 4 "Compensation," Section 11 "Default and Termination," Section 12 "Dispute Resolution," Section 15 "Insurance and Bonds,"** and **Section 16 "Other Provisions,"** respectively, and all other rights and obligations of the Parties which by their express terms or by their nature or implication are intended to survive termination of this Agreement, shall survive, and shall not be affected by, the termination of the Agreement (in whole or in part), or the suspension, completion and/or acceptance of the Work (or any part thereof), or final payment to General Contractor.

16.23 No Release of Responsibility. No inspection made, acceptance of Work, payment of money or approval given by NMHU shall relieve General Contractor of its obligations for the proper performance of the Work in accordance with the terms hereof. NMHU may reject any Work with defects or which is not in accordance with the requirements of this Agreement, regardless of the stage of completion, the time or place of discovery of error, and whether NMHU previously accepted any or all of such Work through oversight or otherwise. No approval given by NMHU shall be considered as an assumption of risk or liability. Any such approval shall mean that NMHU has no objection to the adoption or use by General Contractor of the matter approved at General Contractor's own risk and responsibility. General Contractor shall have no claim relating to any such matter

approved, including any claims relating to the failure or inefficiency of any method approved.

16.24 Remedies. All rights and remedies of the Parties shall be cumulative, and may, to the extent permitted by Applicable Law, be exercised concurrently or separately, and except as expressly provided herein, the exercise of one right or remedy shall not be deemed to be an election of such right or remedy or to preclude or waive the exercise of any other right or remedy. Each Party's rights under this Agreement are in addition to and not in limitation or exclusion of, any other rights such Party has, whether by contract, operation of law or otherwise, except as expressly provided herein.

16.25 No Consequential Damages, Limitation of Liability. In no event shall NMHU be liable under any provision of this Agreement for any indirect, consequential, special, punitive or incidental damages or costs of General Contractor or its Affiliates, whether based in contract, tort (including, without limitation, negligence or strict liability), or otherwise, and General Contractor hereby waives, releases and discharges any and all indirect, consequential, special, punitive and incidental damages and costs. Consequential damages shall include, without limitation, loss of revenue, loss of profits, cost of capital, loss of business reputation and opportunity. In no event shall NMHU's liability under any Task Order be greater than the Fixed Price or Ceiling Price, if applicable.

16.26. Limitation of Indemnities. In all cases, NMHU's liability and that of its directors, officers, employees, agents, and contracts is subject to the New Mexico Tort Claims Act, §§41-4-1 et seq., NMSA 1978, as amended. .

16.29 Miscellaneous. Unless the context of this Agreement otherwise requires: (a) the headings contained in this Agreement are used solely for convenience and do not constitute a part of this Agreement between the Parties, nor should they be used to aid in any manner to construe or interpret this Agreement; (b) the gender of all words used herein shall include the masculine, feminine and neuter and the number of all words shall include the singular and plural words; (c) the terms "hereof", "herein" "hereto" and similar words refer to this entire Agreement and not to any particular Article, Section, Exhibit, Task Order or any other subdivision of this Agreement; (d) reference to "Agreement," "Task Order," "TO," "Change Order," "Amendment," "Contract Documents" or any other agreement or document shall be construed as a reference to such agreement or document as the same may be amended, modified, supplemented or restated, and shall include a reference to any document which amends, modifies, supplements or restates, or is

entered into, made or given pursuant to or in accordance with its terms; (e) references to any law, statute, rule, regulation or other Applicable Law shall be construed as a reference to the same as on the date hereof and as may from time to time be, amended, modified, enacted or re-enacted; (f) references to any Person shall be construed as a reference to such Person's successors and permitted assigns; and (g) references to "includes," "including" and similar phrases shall mean "including, without limitation."

IN WITNESS WHEREOF, General Contractor and NMHU have caused this Agreement to be executed on their behalves by their duly authorized representatives as of the Effective Date first set forth above.

GENERAL CONTRACTOR	NM HIGHLANDS UNIVERSITY
By: _____	By: _____
Printed name: _____	Printed name: _____
Title: _____	Title: _____

EXHIBIT A
FORM OF TASK ORDER

New Mexico Highlands University
INDIVIDUAL TASK AUTHORIZATION (ITA)

AGREEMENT NUMBER	EFFECTIVE DATE OF AGREEMENT	Task Order NUMBER	DATE OF Task Order
PROJECT			
GENERAL CONTRACTOR			

In accordance with the Agreement, New Mexico Highlands University (**"NMHU"**) directs and the General Contractor agrees to perform the following Work:

SEE Exhibit 1 – Scope of Work

NMHU's Task Order Supervisor:

General Contractor's Task Order Manager:

Attachments to Task Order:

Commencement Date:

Required Substantial Completion Date:

Required Final Completion Date:

General Contractor shall be reimbursed for the Work on the following basis:

☐ **Task Order Sum**

☐ At a Fixed Price which shall be $

☐ Time and materials basis. The labor rates are set forth in the Rate Schedule.

Ceiling Price: $

☐ **PAYMENT**

☐ In progress payments at the rate of $ Ceiling Price $

☐ In a single sum payment which shall be $

☐ **OTHER**

☐ **Section 15.2(d)** of the Agreement is applicable to this ITA.

☐ **Section 15.2(e)** of the Agreement is applicable to this ITA.

☐ **Section 15.2(g)** of the Agreement is applicable to this ITA.

☐ **Section 16.13** of the Agreement is applicable to this ITA.

Liquidated Damages for Delay. If General Contractor does not achieve Substantial Completion of the Work on or before the Required Substantial Completion Date set forth above, for reasons not directly caused by the improper actions or omissions of NMHU or Uncontrollable Forces, General Contractor shall pay to NMHU (by direct payment and/or set off from the Task Order Sum or any partial, progress or final payment thereof, at NMHU's sole option), the sum of $_____ per day for the period from the Required Substantial Completion Date until Substantial Completion occurs, up to a maximum amount of __% of the Task Order Sum, which amount is agreed upon as the liquidated damages which NMHU will sustain in case of the failure of General Contractor to achieve Substantial Completion of the Work within the Period of Performance, and this amount is not to be construed as in any sense a penalty. This amount is fixed upon and agreed by the Parties because of the impracticability and extreme difficulty of fixing and ascertaining the actual amount of Damages NMHU would sustain in the event of such delay and is agreed to by both Parties to be reasonable in amount. Assessment of liquidated damages shall not release General Contractor from any further obligations or liabilities pursuant to the Contract Documents. For the purposes of this provision, the date of achieving Substantial Completion shall be the date

that NMHU receives from General Contractor the executed Substantial Completion certificate that is accepted by NMHU.

Capitalized terms used and not defined herein shall have the meaning set forth in the Agreement. Except as modified hereby, the Agreement shall remain in full force and effect and unmodified.

New Mexico Highlands University

AUTHORIZED REPRESENTATIVE	NAME (Typed or Printed)

Accepted By General Contractor*:*

SIGNATURE	NAME (Typed or Printed)	DATE

EXHIBIT B
FORM OF CHANGE ORDER

NEW MEXICO HIGHLANDS UNIVERSITY
CHANGE ORDER

AGREEMENT NUMBER	EFFECTIVE DATE OF AGREEMENT	TASK ORDER NUMBER	DATE OF TASK ORDER
CHANGE ORDER NO.	EFFECTIVE DATE OF CHANGE ORDER		
PROJECT/SUBJECT			
GENERAL CONTRACTOR			

In accordance with **Section 5** of that certain Construction Agreement dated _____ (the **"Agreement"**), between _____ (**"General Contractor"**) and New Mexico Highlands University (**"NMHU"**), General Contractor and NMHU agree as follows:

Description of Change:

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

Original Task Order Sum $_____
Previous Change Orders $_____
Amount of this Change Order $_____
New Task Order Sum $_____

This Change Order will modify the Required Substantial Completion Date as follows:
_____ Increase _____Decrease _____No Effect _____Days

This Change Order will modify the Required Final Completion Date as follows:
_____ Increase _____Decrease _____No Effect _____Days

Capitalized terms used and not defined herein shall have the meaning set forth in the Agreement. Except as modified hereby, the Agreement shall remain in full force and effect and unmodified.

ACCEPTED BY GENERAL CONTRACTOR	**ACCEPTED BY NEW MEXICO HIGHLANDS UNIVERSITY**
By: _ _____	By: _ _____
Printed name: _____	Printed name: _____
Title: _____	Title: _____

EXHIBIT C-1
FORM OF PARTIAL LIEN WAIVER

[GENERAL CONTRACTOR]
PARTIAL LIEN WAIVER AND RELEASE

In accordance with **Section 4 "Compensation"** of that certain Construction Agreement dated _____ (**"Agreement"**), between _____ (**"General Contractor"**) and the Board of Regents for New Mexico Highlands University (**"NMHU"**), and for and in consideration of the payments made to General Contractor by NMHU for the labor, materials, equipment and other Work on and related to the appurtenances located at the premises known as:

[INSERT SHORT DESCRIPTION AND ADDRESS OR LOCATION OF PREMISES]

(the **"Facility"**), General Contractor hereby certifies as follows:

1. Upon receipt of the sum of $_____, General Contractor will have received payment in full for all deliveries of materials and equipment to and/or for all Work performed or furnished under the Agreement through the ___ day of _____ (**"Partial Completion Date"**) and, except for receipt of said payment and as an inducement to NMHU to make same, General Contractor makes the representations, warranties, releases and indemnifications set forth herein.

2. General Contractor does hereby waive, release, discharge and quit claim in favor of NMHU each and every Person acquiring title to and/or making a loan on the Facility, and any and all of their successors and assignees, any and all rights that presently exist or hereafter may accrue to General Contractor to assert a lien or encumbrance (including, without limitation, common law, contractual, statutory and constitutional mechanic's liens, materialman's liens and labor liens) upon the land, improvements, labor, Work, and materials and equipment comprising the Facility or relating to the Facility furnished through the Partial Completion Date.

3. General Contractor does hereby forever release, waive, and discharge the Facility and NMHU from any and all liens (including, without limitation,

common law, contractual, statutory and constitutional mechanic's liens, materialman's liens and labor liens), right to establish a lien, causes of action, suits, debts, accounts, Damages, encumbrances, judgments, claims, and demands of whatsoever kind or nature, in law or equity, including, without limitation, claims for extensions of time or increase in compensation, which General Contractor and/or its successors and/or assignees ever had, now have or ever will have against NMHU and the Facility, by reason of delivery of materials and equipment and/or the performance of Work, for materials and equipment delivered and Work performed through the Partial Completion Date, and/or events or circumstances occurring or existing through the Partial Completion Date, and, to the fullest extent allowed by law, **General Contractor shall indemnify, defend and hold harmless NMHU and its directors, officers, employees, representatives, agents, advisors, consultants and counsel from and against any and all Damages asserted or awarded against or incurred by such indemnitees arising out of, resulting from or relating to any of the foregoing claims and liens so released.**

4. General Contractor has not assigned any claim against NMHU or the Facility, nor any lien or right to perfect a lien against NMHU, the Work, the Work site or the Facility, and General Contractor has the right, power, and authority to execute this Partial Release.

5. General Contractor warrants that there are no outstanding claims by General Contractor or any SubGeneral Contractors for unpaid billings in connection with the Work. General Contractor warrants that all laborers employed by it, all SubGeneral Contractors which have performed services, and all SubGeneral Contractors from which it has acquired materials and equipment consumed in or incorporated into the Work, and any lien or bond claimant relating to the Work have been paid in full and that none of such Persons, has any claim, demand, or lien against NMHU, the Work, the Work site or the Facility through the Partial Completion Date. General Contractor further warrants that all applicable taxes, fees, and benefits relating directly or indirectly to the Work have been paid in full.

6. No security interest has been given or executed by General Contractor for or in connection with any materials, equipment, appliances, machinery, fixtures, or furnishings placed upon or installed on the Facility, the Work or the Work site.

7. This Partial Lien Waiver and Release shall be an independent covenant and shall operate and be effective with respect to Work performed and/or

materials and equipment furnished, and under any supplemental contract or contracts, whether oral or written, for extra or additional Work on the Facility through the Partial Completion Date.

Capitalized terms used and not defined herein shall have the meaning set forth in the Agreement.

IN WITNESS WHEREOF, this Partial Lien Waiver and Release has been executed on this ____ day of _____.

[GENERAL CONTRACTOR]

By:_____
Printed Name:_____
Title:_____

STATE OF _____)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this___day of _____by _____, as _____ of _____.
(Position) *(Name)* *(General Contractor)*

_____
Notary Public

My Commission Expires:

_____

EXHIBIT C-2
FORM OF FINAL LIEN WAIVER

[GENERAL CONTRACTOR]
FINAL LIEN WAIVER AND RELEASE

In accordance with **Section 4 "Compensation"** of that certain Construction Agreement dated _____ (**"Agreement"**), between _____ (**"General Contractor"**) and the Board of Regents for New Mexico Highlands University (**"NMHU"**), and for and in consideration of the payments made to General Contractor by NMHU for the Work, materials and equipment on and related to the appurtenances located at the premises known as:

[INSERT SHORT DESCRIPTION AND ADDRESS OR LOCATION OF PREMISES]

(the **"Facility"**), General Contractor hereby certifies as follows:

1. General Contractor has received final payment in full for all deliveries of materials and equipment to and/or for all Work performed or furnished under the Agreement. General Contractor represents and warrants that there are no outstanding claims by General Contractor or any SubGeneral Contractors or other Person providing materials, equipment, services or labor in connection with the Work.

2. General Contractor does hereby waive, release, discharge and quit claim in favor of NMHU each and every Person acquiring title to and/or making a loan on the Facility, and any and all of their successors and assignees, any and all rights that presently exist or hereafter may accrue to General Contractor to assert a lien or encumbrance (including, without limitation, common law, contractual, statutory and constitutional mechanic's liens, materialman's liens and labor liens) upon the land, improvements, labor, Work, and materials and equipment comprising the Facility or relating to the Facility.

3. General Contractor does hereby forever release, waive, and discharge the Facility and NMHU from any and all liens (including, without limitation, common law, contractual, statutory and constitutional mechanic's liens, materialman's liens and labor liens), right to establish a lien, causes of action, suits,

debts, accounts, Damages, encumbrances, judgments, claims, and demands of whatsoever kind or nature, in law or equity, including, without limitation, claims for extensions of time or increase in compensation, which General Contractor and/or its successors and/or assignees ever had, now have or ever will have against NMHU and the Facility, by reason of delivery of materials and equipment and/or the performance of Work, for materials and equipment delivered and Work performed, and/or events or circumstances occurring or existing through the date hereof, and, to the fullest extent allowed by law, **General Contractor shall indemnify, defend and hold harmless NMHU and its respective directors, officers, employees, representatives, agents, advisors, consultants and counsel from and against any and all Damages asserted or awarded against or incurred by such indemnitees arising out of, resulting from or relating to any of the foregoing claims and liens so released.**

4. General Contractor has not assigned any claim against NMHU or the Facility, nor any lien or right to perfect a lien against NMHU, the Work, the Work site or the Facility, and General Contractor has the right, power, and authority to execute this Final Release.

5. General Contractor warrants that all laborers employed by it, all SubGeneral Contractors which have performed services, and all SubGeneral Contractors from which it has acquired materials and equipment consumed in or incorporated into the Work, and any lien or bond claimant relating to the Work have been paid in full and that none of such Persons, has any claim, demand, or lien against NMHU, the Work, the Work site or the Facility. General Contractor further warrants that all applicable taxes, fees, and benefits relating directly or indirectly to the Work have been paid in full.

6. No security interest has been given or executed by General Contractor for or in connection with any materials and equipment, appliances, machinery, fixtures, or furnishings placed upon or installed on the Facility, the Work or the Work site.

7. This Final Lien Waiver and Release shall be an independent covenant and shall operate and be effective with respect to Work performed and/or materials and equipment furnished, and under any supplemental contract or contracts, whether oral or written, for extra or additional Work on the Facility. This Final Release shall survive final completion of and final payment for the Work.

Capitalized terms used herein but not defined shall have the meaning set forth in the Agreement.

IN WITNESS WHEREOF, this Final Lien Waiver and Release has been executed on this ____ day of _____.

[GENERAL CONTRACTOR]

By:_____
Printed Name:_____
Title:_____

STATE OF _____)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this ___ day of _____ by _____, as _____ of _____.
(Name) *(Position)*
(General Contractor)

_____
Notary Public

My Commission Expires:

_____

EXHIBIT D-1
FORM OF SUBSTANTIAL COMPLETION CERTIFICATE

[GENERAL CONTRACTOR]
CERTIFICATE OF SUBSTANTIAL COMPLETION

_____ (**"General Contractor"**), in accordance with **Section 10.1 "Substantial Completion"** of that certain Construction Agreement dated _____ (**"Agreement"**), between General Contractor and the Board of Regents for New Mexico Highlands University, does hereby certify that:

1. Substantial Completion has been achieved in accordance with the terms of the Agreement. All Work required for Substantial Completion has been properly completed in accordance with the Contract Documents, including, without limitation, the following: [specify key elements of Substantial Completion of the Work]

Capitalized terms used and not defined herein shall have the meaning set forth in the Agreement.

IN WITNESS WHEREOF, General Contractor has caused this Certificate of Substantial Completion to be duly executed and delivered this ____ day of _____.

[GENERAL CONTRACTOR]

By:_____
Printed Name:_____
Title:_____

STATE OF _____)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this ___ day of _____by _____, as _____ of _____.
(Position) *(Name)* *(General Contractor)*

_____
Notary Public

My Commission Expires:

_____

EXHIBIT D-2
FORM OF FINAL COMPLETION CERTIFICATE

[GENERAL CONTRACTOR]
CERTIFICATE OF FINAL COMPLETION

_____ (**"General Contractor"**), in accordance with **Section 10.3 "Final Acceptance"** of that certain Construction Agreement dated _____ (**"Agreement"**), between General Contractor and the Board of Regents for New Mexico Highlands University (**"NMHU"**), does hereby certify that:

1. All Work, excepting Work to be performed with respect to warranty obligations, is finally and completely performed in accordance with the terms of the Contract Documents, including, without limitation:

2. Substantial Completion has been achieved;

3. All Punch List Work has been completed;

4. NMHU has received a Final Release of Liens, in the form of **Exhibit C-2** to the Agreement, from General Contractor and all SubGeneral Contractors;

5. General Contractor has transferred to NMHU all final documentation, records, specifications, procedures, As-Built drawings, and test reports required by the Agreement to be delivered to NMHU;

6. All General Contractor's and SubGeneral Contractors' personnel, supplies, waste, materials, rubbish, equipment and temporary facilities have been removed from the Work site and the Work site has been restored to its original condition as required; and

7. All SubGeneral Contractors have been paid in full.

Capitalized terms used and not defined herein shall have the meaning set forth in the Agreement.

IN WITNESS WHEREOF, General Contractor has caused this Certificate of Final Completion to be duly executed and delivered this ____ day of _____.

[GENERAL CONTRACTOR]

By:_____
Printed Name:_____
Title:_____

STATE OF _____)
) ss.
COUNTY OF _____)

This instrument was acknowledged before me this ___ day of _____ by _____, as _____ of _____.
(Position) *(Name)* *(General Contractor)*

_____
Notary Public

My Commission Expires:

_____

EXHIBIT E
COST SCHEDULE

GENERAL CONTRACTOR'S COSTS

GC BUSINESS NAME: _____

1		General Conditions	$
	1	Bonds/Permits/Fees/Insurance	$
	2	LEED Costs	$
	3	SWIPP (If applicable)	$
	4	Site Prep	$
	5	Sanitation	$
	6	Site Work	$
	7	Site Utilities	$
	8	Footings	$
	9	Preserve & Protect (If applicable)	$
	10	Water Catchment System (If applicable)	$
	11	Landscaping (If applicable)	$
	12	Parking Lot (If applicable)	$
	13	Demo	$
	14	Hazmat	$
	15	Concrete	$
	16	Structural	$
	17	Mechanical / HVAC costs	$
	18	HVAC Controls	$
	19	Electrical costs	$

20	Low-Voltage Cabling	$
21	Plumbing costs	$
22	Fire Suppression System	$
23	Fire Alarm	$
24	Toilet Accessories	$
25	Metal Framing	$
26	Acoustical	$
27	Insulation	$
28	Carpentry	$
29	Tape & Texture	$
30	Case work	$
31	Interior Painting	$
32	Doors & Frames	$
33	Door Hardware	$
34	Aluminum Storefront	$
35	Aluminum Clad & Metal Windows	$
36	Tile, vinyl flooring, and cove base	$
37	Stairs	$
38	Interior Finishes	$
39	Directories/ Tackboards / Signage	$
40	Other Costs (be specific)	$
41	GC Overhead + Profit	$
42	New Mexico Gross Receipts Tax	$_____

TOTAL MACC COSTS:

BONDS AND INSURANCE

BONDS:

1. Proposal Security: Must be submitted with Price Proposal using AIA Document 310, or similar standard form acceptable to Owner.

2. Performance and Labor and Material Payment Bonds: Contractor shall furnish in connection with the performance of the Work, in a form acceptable to Owner (AIA Documents A 312, or similar standard form acceptable to Owner) and executed by a surety company satisfactory to Owner, a payment bond for the protection of persons furnishing labor and materials and a performance bond for the protection of Owner. The penal sum of each bond shall be equal to the Contract Sum. Bonds shall be dated as of the Effective Date of this agreement and shall be furnished promptly by Contractor to Owner, accompanied by a certified copy of the “Power of Attorney” document issued by the surety company. Contractor shall notify the surety of any changes affecting the general scope of the Work or change in the Contract Sum and the amount of the applicable bonds shall be adjusted accordingly. Contractor shall furnish proof of such adjustment to Owner upon request. The performance bond shall remain in effect until satisfactory completion of all of Contractor's obligations under this Agreement (including performance of warranty obligations). The labor and material payment bond shall remain in effect until final payment is made to all tiers of subcontractors, suppliers and other furnishing labor or materials.

3. Modification to Bonds: Paragraph 6 of this Payment Bond is deleted in its entirety and replaced with the following provision: “Within 45 days (1) after the claimant has satisfied the conditions of Paragraph 4 and (2) after the Surety has received at its home office all supporting documentation it requested to substantiate the amount of the claim, the Surety shall pay or arrange for payment of any undisputed amounts. Failure of the Surety to satisfy the above requirements shall not be deemed a forfeiture or waiver of the Surety’s or the Contractor’s defenses under this Bond or their right to dispute such claim. However in such event the claimant may bring suit against the Surety as provided under this Bond.

INSURANCE:

Contractor's insurance requirements are as set forth in these documents. Four (4) signed copies of all required certificates, endorsements, or other evidence of insurance must be delivered to Owner. The forms of any required insurance certificates or insurance endorsements are attached as part of this Section 00 6000, or are as described herein.

Insurers must (1) be authorized to do business in New Mexico; (2) maintain an address for service of process in New Mexico; and (3) either (a) have an “A” policyholder’s rating

and a financial rating of at least Class XI in accordance with the most current A.M. Best's Rating; or (b) be acceptable to Owner as evidenced by Owner's written approval of such insurer.

If mandatory deductibles should be required under the terms of any insurance to be provided for this project, or if Contractor should elect to increase the mandatory deductible amounts or purchase insurance with voluntary deductible amounts, the Contractor shall not be entitled to any reimbursement from Owner for payment of the amount of the deductible in the event of a paid claim. Owner must approve any changes in deductible amounts in writing.

Certificates of insurance and endorsements must be on forms acceptable to Owner and delivered to Owner prior to commencement of the work. The Contractor shall furnish a Certificate of Insurance under current form of ACORD 25 (2010/05).

In addition, if requested by Owner, Contractor shall deliver to Owner a certified copy of any policies called for in these documents including any endorsements, addenda or amendments to such policies within 10 days. If Owner is damaged by Contractor's failure to obtain and maintain the required insurance, then Contractor shall be liable to Owner for all costs, expenses and damages which may result, including reasonable attorney's fees. All insurance policies to be furnished by Contractor for purposes of this project shall be subject to approval by Owner. All policies shall be on an occurrence as opposed to claims made basis.

To the extent Contractor or any Subcontractor would be reimbursed by Owner for any loss covered by the insurance provided, the Contractor or Subcontractor shall waive any claim they may have for such reimbursement to the extent covered by the insurance.

The types of insurance the Contractor shall obtain and maintain are as follows:

Workers' Compensation Insurance and Employers' Liability:

Workers' Compensation Insurance and Employers' Liability insurance shall be maintained in full force and effect for the full warranty period provided for in the contract documents. Contractor shall comply with all applicable provisions of the New Mexico Workers' Compensation Act, and the New Mexico Occupational Disease Disablement Law. Workers' and Employer's Liability insurance will be procured and maintained in accordance with New Mexico laws and regulations.

Contractor shall require each Subcontractor to provide the same Workers' Compensation and Employers' Liability coverage for all the Subcontractor's employees working on the project. Neither Owner nor the Design Professional, their directors, officers, board members, representatives, agents or employees will be responsible for any claims or actions occasioned by the failure of the Contractor to comply with this obligation.

At the time of the Contractor's execution of the contract, Contractor shall deliver to Owner a certificate(s) of insurance testifying that he has obtained full Workers' Compensation and Employer's Liability insurance coverage, for all persons whom he employs or may employ during the course of the project. Such coverage shall be maintained for the duration of the contract and the warranty period and shall meet the most current requirements.

Liability Insurance:

General Liability Insurance shall be provided with the following limits.

$1,000,000 General Aggregate
$1,000,000 Products/Completed Operations Aggregate
$1,000,000 Personal Injury and Advertising Injury
$1,000,000 Each Occurrence
$50,000 Fire Damage (any one fire)
$5,000 Medical Expense (any one person)

The policy shall include coverage for bodily injury liability, broad form property damage liability, blanket contractual liability, Contractor's protective liability, products liability and completed operations. Where applicable, the policy shall include coverage for the hazards commonly referred to as "XCU."

Business Automobile Liability Insurance with a minimum limit of not less than Two Million Dollars ($2,000,000) per accident with respect to Contractor's vehicles whether owned, hired, or non-owned, assigned to or used in the performance of any Work required to be performed by Contractor pursuant to the Contract Documents. Excess insurance or umbrella liability insurance will be acceptable in attaining the required limits.

Builder's Risk Insurance:

Contractor shall obtain and maintain Builder's Risk "Special Form" insurance coverage for full insurable value to replace or repair up to the contract sum, with provision for endorsements to increase coverage if the contract sum is increased. Such insurance coverage shall include the interests of Owner, Contractor, Subcontractor and Subsubcontractors in the work and shall insure without limitation against the perils of fire with extended coverage and shall include "Special Form" insurance for the physical loss or damage including, without duplication of coverage, theft, vandalism, and malicious mischief. Such coverage shall include work in progress and completed work. If not covered by the "Special Form" insurance, Contractor shall also obtain similar property insurance coverage on portions of the work stored off the site or in transit when such portions of the work are to be included in an application for payment. Such insurance shall include as additional insured Owner, Owner's representative(s) and each of their respective directors, officers, board members, employees and agents. The

form of coverage and policy called for herein must be accepted and approved by Owner.

Such insurance may have a deductible clause but not to exceed $5000 per occurrence. Contractor shall be liable for the deductible on any loss to which the deductible applies.

Any loss insured under this section shall be adjusted with Owner and made payable to Owner. Upon receipt of the insurance proceeds Owner shall reimburse Contractor or his Subcontractors for any insured losses less any deductible charged to Owner.

Contractor shall deliver to Owner such endorsements to the coverage provided herein to insure coverage of the entire work even if Owner should take partial occupancy of part of the work before substantial completion is reached on all the work. The policy shall contain a “Permission to Occupy” endorsement acceptable to Owner.

MINIMUM WAGE RATE INFORMATION

The New Mexico State Minimum Wage Rates applicable for this Contract, as evidenced by the attached determination by the New Mexico Labor and Industrial Commission, shall be paid to all workers employed in the performance of the Work. See Request for Proposals and General Conditions to the Owner/Contractor Agreement.

(Wage Rate Schedules Attached)

NM DECISION NO.____ , dated __

DOCUMENTS FOLLOW

GENERAL CONDITIONS

The General Conditions of this Contract are incorporated in the standard NMHU General Conditions of the Contract for Construction.

A sample Agreement is previously attached (see 00 5000).

DOCUMENT FOLLOWS

NEW MEXICO
HIGHLANDS
UNIVERSITY

AFFIRMATIVE ACTION

Contractor shall not maintain or provide racially segregated facilities for employees at any establishment under his control. Contractor agrees to adhere to the principle set forth in Executive Order 11246 and 11375, and to undertake specifically to maintain employment policies and practices that affirmatively promote equality of opportunity for minority group persons and women; to take affirmative steps to hire and promote women and minority group persons at all job levels and in all aspects of employment; communicate this policy in both English and Spanish to all persons concerned within his company, with outside recruitment services and the minority community at large; to provide NMHU on request a breakdown of his labor force by ethnic group, sex, and job category; and to discuss with NMHU his policies and practices relating to his affirmative action program.

AMENDMENT TO CONTRACT

This Contract shall not be altered, changed, or amended except by an instrument in writing executed by both parties.

INDEMNIFICATION AND INSURANCE

Contractor assumes the entire responsibility and liability for losses, expenses, damages, demands and claims in connection with or arising out of any actual or alleged personal injury (including death) and/or damage or destruction to property sustained or alleged to have been sustained in connection with or arising out of the performance of the work by Contractor; its agents, employees, subcontractors or consultants, except to the extent of liability arising out of the negligent performance of the work by or willful misconduct of NMHU. Contractor shall indemnify and hold harmless NMHU; its officers, agents and employees from any and all liability for such losses, expenses, damages, demands and claims and shall defend any suit or action brought against any or all of them based on any actual or alleged personal injury or damage and shall pay any damage costs and expenses including attorneys' fees, in connection with or resulting from such suit or action.

Contractor agrees that it and its subcontractors will maintain public liability and property insurance in reasonable amounts covering the above obligation and will maintain workers' compensation coverage covering all employees performing this order on premises occupied by or under the control of NMHU. Contractor is to include NMHU; its officers, Regents, agents and employees as a "Policy Holder" of such liability insurances.

INSURANCE REQUIREMENTS

A. Without limiting any liabilities or any other obligation of the Contractor, the Contractor shall purchase and maintain (and cause its subcontractors to purchase and maintain), in a company or companies lawfully authorized to do business in the State of New Mexico, and rated at least A- VII in the current A.M. Best's, the minimum insurance coverage as follows:

1. Commercial General Liability Insurance with not less than $1,000,000 combined single limit of liability for bodily injury and property damage for each occurrence. The policy shall include coverage for:
   a. Bodily Injury;
   b. Broad Form Property Damage;
   c. Independent Contractors Coverage;
   d. Personal Injury;
   e. Blanket Contractual Liability;
2. Workers' Compensation and Employer's Liability Insurance covering each employee engaged in the performance of the Work under this Contract, with a limit of liability in accordance with applicable law in the case of Workers' Compensation Insurance, and with the following limits of liability in the case of Employer's Liability Insurance:

Bodily injury by accident	$500,000 each accident
Bodily injury by disease	$1,000,000 policy limit
Bodily injury by disease	$500,000 each employee

3. Comprehensive Motor Vehicle Liability Insurance (if Contractor plans to utilize motorized automobiles for providing its food services) covering all owned, non-owned, and hired vehicles used in connection with the activities undertaken under this Contract, with a combined single limit of liability for bodily injury and property damage of not less than $500,000 per occurrence.
4. Umbrella liability coverage of $2,000,000 per occurrence.

B. The Contractor shall furnish the NMHU one (1) copy each of Certificates of Insurance herein required for each copy of the Contract, showing coverage, limits of liability, covered operations, effective dates of expiration of policies of insurance carried by the Contractor. The Contractor shall furnish to the NMHU copies of limits. The Certificate of Insurance shall be in a format acceptable to the NMHU. Such certificates shall be filed with NMHU and shall also contain the following statements in the description section of the Certificate of Insurance:

"The Regents of New Mexico Highlands University, New Mexico Highlands University, its agents, servants and employees are held as additional named insured."

and

"The insurance coverage certified herein shall not be cancelled or materially changed except after the insurer endeavors to provide forty-five (45) days written notice to the Owner."

C. The Certificate of Insurance shall be forwarded to:

New Mexico Highlands University
Attn: Purchasing Department
P.O. Box 9000
Las Vegas, NM 87701

D. The State of New Mexico, its departments, agencies, boards and commissions reserve the right to request and receive certificates of insurance evidencing the required policies and endorsements within ten (10) calendar days of Contract signature.

E. Failure on the part of the Contractor to meet these requirements shall constitute a material breach of contract, upon which the State of New Mexico, its departments, agencies, boards and commissions may terminate this Contract in accordance with

the provisions of this RFP and the resultant Contract, at its discretion, procure or renew such insurance and pay any and all premiums in connection therewith, and all monies so paid by the State of New Mexico, its departments, agencies, boards and commissions shall be repaid by the Contractor upon demand, or the State of New Mexico, its departments, agencies, boards and commissions may offset the cost of the premiums against any monies due to the Contractor. Costs for coverage broader than those required or for limits in excess of those required shall not be charged to the State of New Mexico, its departments, agencies, boards and commissions. Contractor, NMHU, and their insurer(s) shall waive their rights of recovery against the one another and their employees and officers and, with respect to the Contractor, the State of New Mexico, its departments, agencies, boards, and commissions.

OTHER APPLICABLE LAWS

Any provision required to be included in a contract of this type by any applicable and valid Executive order, federal, state or local law, ordinance, rule or regulation shall be deemed to be incorporated herein. These terms & conditions are in addition to the State of New Mexico Procurement Code, §13-1-28 N.M.S.A. 1978. Any conflicts in these and other NMHU Terms & Conditions are superseded by the Procurement Code and Federal laws. In such a situation, all contracts, purchase orders, agreements and other related documents may be null and void.

COMPLIANCE WITH LAWS

The Contractor shall be familiar with, have a working knowledge of, and comply with all Federal, State, and local regulations, ordinances, codes and laws having jurisdiction over the services described herein. In addition, the Contractor must be familiar with and have experience preparing and filing all required forms, reports, and submittals. The Contractor hereby represents and warrants that:

A. It is qualified to do business in the State of New Mexico and that it will take such action as, from time to time, may be necessary to remain so qualified;

B. It is not in arrears with respect to the payment of any monies due and owing the State of New Mexico or any department or unit thereof, including but not limited to the payment of taxes and employee benefits, and that it shall not become so in arrears during the term of this Contract;

C. It shall comply with all Federal, State and local laws, regulations and ordinances applicable to its activities and obligations under this Contract; and

D. It shall procure, at its expense, all licenses, permits, insurance and governmental approvals, if any, necessary to the performance of its obligations under this Contract.

E. Agrees to operate under and be controlled by the Civil Rights Act of 1964, Title VI, and Executive Order No. 11246.

NEW MEXICO LAW PREVAILS

The place of performance of this Contract shall be the State of New Mexico. This Contract shall be construed, interpreted, and enforced according to the laws of the State of New Mexico, and all claims and disputes shall be brought in the state courts of the State of New Mexico.

PREVAILING WAGES

In accordance with §13-4-10, "Public Works Minimum Wage Act", every contract or project in excess of sixty thousand dollars ($60,000) shall require a Wage Rate Determination and for the contractor, subcontractor, employer or a person acting as a contractor (hereinafter called "Contractor")shall pay all mechanics and laborers employed on the project, wages and fringe benefits as required of the Act.

The Contractor shall comply with all provisions and requirements of the Public Works Minimum Wage Act.

PUBLIC WORKS REGISTRATION

In accordance §13-4-13.1, all bidders or proposers submitting a bid or quote at more than sixty thousand dollars ($60,000) shall be registered with the Labor Relations Division of the Workforce Solutions Department.

SEVERABILITY

In the event any term or provision of this Contract or any application to any person or circumstance shall be declared prohibited, invalid, or unenforceable to any extent in any jurisdiction, as determined by a court of competent jurisdiction, such term or provision shall, in that jurisdiction, be ineffective only to the extent of such prohibition, invalidity, or unenforceability, or as applied to such persons or circumstances, without invalidating or rendering unenforceable the remaining term or provision hereof or affecting the validity or enforceability of such term or provision in any other jurisdiction or as to other persons or circumstances in such jurisdiction, unless such would effect a substantial deviation from the general intent and purpose of the parties or make a significant change in the economic effect of the contract on the party benefited by such term or provision.

SUBCONTRACTORS FAIR PRACTICES ACT

All Contractors shall comply with §13-4-31, the "Subcontractors Fair Practices Act".

SURVIVAL

The University and the Contractor agree that those obligations of the parties which by their terms require performance after termination or expiration of the contract, shall survive the termination or expiration of the contract.

CONFLICT OF INTEREST

The Contractor warrants that he/she has no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of Work required under this Contract. The Contractor shall comply with the provisions of Section §10-16-12 N.M.S.A. 1978, which requires disclosure to the Office of Secretary of State of amounts received under state contracts when and if such provisions become applicable.

TERMINATION OF CONTRACT

A. Cancellation Without Cause for Convenience

1. Either party may cancel this Contract and/or the rendering of Services without cause by providing the other party written notice at least ninety (90) days prior to the non-renewal or expiration of the initial one (1) year term or during any subsequent one (1) year term. If cancellation is made by NMHU, it will be considered a cancellation for convenience;

2. Cancellation will be considered on the day the party mails or emails the cancellation notice. If emailed, an original must be mailed to the other party within two (2) business days;
3. Cancellation without cause does not grant the Contractor any financial compensation for future, anticipated or unearned profits;
4. The Contractor will be paid for Services rendered and accepted up to the last day of the cancellation. The Contractor is to continue to provide its Services until the last day of the cancellation and will be required to complete any and all remaining obligations; and
5. In the event of termination and/or expiration of this Contract, Contractor agrees to provide reasonable cooperation in ensuring a smooth transition to another provider of Services.

B. Cancellation for Default

1. Should the Contractor at any time violate any material conditions of the Contract or fail to comply with any of his contractual obligations, NMHU may, by written notice to the Contractor, demand that the Contractor remedy such violation or failure. Failure on the part of the Contractor to fulfill contractual obligations shall be considered just cause for termination of this Contract. NMHU will then no longer be bound to the Contract or further obligations;
2. If, after receipt of the notice from NMHU specifying each failure, the Contractor does not cure such failure within a period of twenty (20) business days, or by a different deadline specified by NMHU if, in its sole discretion, it feels a different period is acceptable, NMHU may terminate the whole or part of the Contract in question. An exception to this policy will occur in cases where the deficiency is deemed by NMHU to have the potential to result in direct endangerment to the health of any individual or individuals associated with Contractor or NMHU. In this case, NMHU may choose to intercede and take immediate corrective action, charging all costs of doing so to the Contractor;
3. If the Contractor does not correct a deficiency upon written notice by NMHU and within the time frame specified, NMHU may terminate the Contract by written notice to the Contractor. The notice shall specify the acts or omissions relied upon as cause for termination. NMHU shall pay the Contractor fair and equitable compensation for satisfactory performance prior to receipt of notice of termination, less the amount of damages caused by Contractor's breach. If the damages are more than the compensation payable to the Contractor, the Contractor will remain liable after termination and NMHU can affirmatively collect damages;
4. In the event that NMHU terminates the Contract in whole or in part as provided herein, it may procure, in such a manner as it deems reasonable and appropriate, such Services as required by the Contract and the Contractor shall be liable for any cost for such Services. However, if the Contract is terminated in part, the Contractor shall be required to continue the performance of the Contract to the extent not terminated under the provisions of this clause, while remaining liable for any cost of Services obtained by NMHU to cover Services canceled due to the Contractor's inability or unwillingness to cure such failure;

5. Upon entry of a judgment of bankruptcy or insolvency by or against the Contractor, NMHU may terminate this Contract; and
6. In the event of termination and/or expiration of this Contract, Contractor agrees to provide reasonable cooperation in ensuring a smooth transition to another provider of Services.

C. Cancellation for Non-Appropriation of Funds

1. If NMHU funds are not appropriated or otherwise made available for continued performance for any fiscal period of this Contract succeeding the first fiscal period, this Contract shall be cancelled automatically as of the beginning of the new fiscal year for which funds were not appropriated or otherwise made available; provided, however, that this will not affect either NMHU's rights or Contractor's rights under any termination clause in this Contract. NMHU's fiscal year begins on July 1st of each year and concludes on June 30th of the following year;
2. The effect of termination of the Contract hereunder will be to discharge both Contractor and NMHU from future performance of the Contract, but not from their rights and obligations existing at the time of termination;
3. NMHU shall notify Contractor as soon as it has knowledge that funds may not be available for the continuation of this Contract or any portion thereof for each succeeding fiscal period beyond the first;
4. NMHU's determination of funding under this section shall be final and accepted by Contractor; and
5. In the event of termination and/or expiration of this Contract, Contractor agrees to provide reasonable cooperation in ensuring a smooth transition to another provider of Services.

D. Termination for Nonpayment

Contractor may terminate this Contract or suspend services for nonpayment of properly submitted and accepted invoices within forty-five (45) days of receipt of the invoice by NMHU. If NMHU disputes an invoice or portions of it, Contractor cannot terminate this Contract for nonpayment of the disputed portions.

STATE PROCUREMENT CODES AND STATUTES

Contractor is hereby put on notice that the State of New Mexico Procurement Code, §13-1-28 et seq. N.M.S.A. 1978, imposes civil and criminal penalties for its violation. In addition, the State of New Mexico criminal statutes impose felony penalties for illegal bribes, gratuities and kickbacks.

OTHER APPLICABLE LAWS

Any provision required to be included in a purchase order or contract of this type by any applicable and valid executive order, Federal, State or local law, ordinance, rule or regulation shall be deemed to be incorporated herein.

ASSIGNMENT

Contractor shall have no right to assign or transfer any of its rights, duties or responsibilities contained in this RFP or subsequent amendments without the prior written approval of NMHU.

LIST OF DRAWINGS

Sheet No.	Sheet Title
GENERAL	
G-001	Cover
G-002	General Information
LIFE SAFETY	
LS-101	Life Safety Systems First Floor Occupancy Egress Plan
LS-102	Life Safety Systems Second Floor Occupancy Egress Plan
CIVIL	
C-101	Grading and Drainage (Water Catchment – Reference Only)
C-102	Site Utility Plan
C-501	Miscellaneous Details (Water Catchment – Reference Only)
C-502	Miscellaneous Details (Water Catchment – Reference Only)
C-503	Miscellaneous Details (Water Catchment – Reference Only)
C-504	Miscellaneous Details
ARCHITECTURAL	
AS-101	Site Demolition Plan
AS-102	Site Plan
AS-103	Enlarged Site Plan
AS-501	Site Details
AD-101	First Floor Demolition Plan
AD-102	Second Floor Demolition Plan
AD-103	Roof Demolition Plan
A-101	First Floor Plan
A-102	Second Floor Plan
A-103	First Floor Dimensioned Plan
A-104	Second Floor Dimensioned Plan
A-105	Enlarged Plans
A-106	Enlarged Plans
A-107	First Floor Reflected Ceiling Plan
A-108	Second Floor Reflected Ceiling Plan
A-109	Roof Plan
A-110	First Floor Finishes Plan
A-111	Second Floor Finishes Plan
A-112	First Floor Furniture Plan (Reference Only)
A-113	Second Floor Furniture Plan (Reference Only)
A-201	Exterior Elevations

A-202	Exterior Elevations
A-203	Interior Elevations
A-204	Interior Elevations
A-205	Interior Elevations
A-206	Interior Elevations
A-207	Interior Hallway Elevations
A-208	Interior Hallway Elevations
A-209	Interior Hallway Elevations
A-210	Interior Hallway Elevations
A-211	Stairway Elevations
A-301	Building Sections
A-302	Wall Sections
A-303	Wall Sections
A-501	Details
A-502	Details
A-503	Stair Details
A-504	Stair Details
A-601	Door Schedule
A-602	Window Schedule
A-603	Finish Schedule

MECHANICAL

MD-101	First Floor Mechanical Demolition Plan
MD-102	Second Floor Mechanical Demolition Plan
MP-101	General Notes and Legend
M-101	Mechanical HVAC First Floor Plan
M-102	Mechanical HVAC Second Floor Plan
M-201	First Floor HVAC Plan
M-202	Second Floor HVAC Plan
M-401	Enlarged Mechanical Room Plans
M-501	Mechanical Details
M-502	Mechanical Details
M-503	Mechanical Details
M-601	Mechanical Schedules
M-701	Mechanical Controls
M-702	Mechanical Controls
M-703	Mechanical Controls

PLUMBING

FP-101	First Floor Fire Protection Plan
FP-102	Second Floor Fire Protection Plan
FP-501	Fire Protection Notes and Details
PD-101	Plumbing First Floor Demolition Plan
PD-102	Plumbing Second Floor Demolition Plan

P-101	First Floor Plumbing Plan
P-102	Second Floor Plumbing Plan
P-401	Plumbing Riser Diagrams
P-501	Plumbing Details
P-601	Plumbing General Notes, Legend & Schedules

ELECTRICAL

E-001	Electrical General Notes, Legend & Schedules
ED-101	Electrical First Floor Lighting Demolition Plan
ED-102	Electrical Second Floor Lighting Demolition Plan
ED-201	Electrical First Floor Demolition Power Plan
ED-202	Electrical Second Floor Demolition Power Plan
E-101	Lighting First Floor Plan
E-102	Lighting Second Floor Plan
E-201	Power First Floor Plan
E-202	Power Second Floor Plan
E-301	First Floor Mechanical Equipment Connections
E-302	Second Floor Mechanical Equipment Connections
E-401	First Floor Fire Alarm Plan
E-402	Second Floor Fire Alarm Plan
E-601	Riser Diagram
E-602	Panel Schedules

INDEX TO TECHNICAL SPECIFICATIONS

DIVISION 21 – FIRE SUPPRESSION

DIVISION 22 – PLUMBING

DIVISION 23 – HEATING, VENTILATION AND AIR CONDITIONING

DIVISION 25 – INTEGRATED AUTOMATION

DIVISION 26 – ELECTRICAL

SECTION 01 1000

SUMMARY

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes:

1. General description of Work and Contractor's duties.
2. Work by others.
3. Work sequence.
4. Contractor use of site.
5. Definitions.
6. Abbreviations.

1.2. WORK COVERED BY CONTRACT DOCUMENTS

Work of this Contract covers renovation of an approximate [26,000] SF [2] story [Sininger Hall] and related site work at [New Mexico Higlands University] in [Las Vegas], New Mexico.

1.3. CONTRACTOR'S DUTIES

A. Except as noted, provide and pay for all labor, materials, and equipment.

B. Pay required sales, gross receipts, and other taxes. Owner will pay Contractor applicable New Mexico gross receipts tax including local option tax and any increase in tax becoming effective after Contract date.

C. Secure and pay for permits (including plan checking fees), fees,and licenses necessary for execution of Work as applicable at time of receipt of bids or as otherwise required in other sections of the Specifications.

D. Give required notices.

E. Comply with codes, ordinances, regulations, and other legal requirements of public authorities which bear on performance of Work.

F. Request required inspections from public authorities, correct any noted deficiencies, and obtain certifications of satisfactory inspection. Deliver certificates to Owner in accordance with Section 01 7800 – Closeout Submittals.

1.4. WORK BY OTHERS

A. Owner will award separate construction contracts for purchase and installation of:

1. [Moveable furniture and equipment except where noted].
2. [Telephone and data cabling and equipment].
3. [Solar Array System]
4. [Closed circuit television wiring and equipment].
5. [Access Control].
6. [Landscaping and irrigation systems].
7. [Re-roofing and roof drainage].
8. [Stucco]
9. [Water Catchment System]
10. [Elevator Upgrades]
11. [Vinyl Tile and Carpet Tile flooring purchase and install]
12. [Other items indicated as “ByOwner”].

B. Items noted "NOTINCONTRACT" (NIC) will be supplied and installed by Owner:

1. [_____].

C. Owner will remove and retain possession of the following items prior to start of Work:

1. [_____].

D. Future work to be performed by others under separate contract to Owner:

1. [_____].

E. Products supplied by Owner for installation by Contractor:

1. [_____].

F. Owner's responsibilities:

1. Schedule and assist Contractor in coordination of work by Owner’s own forces and separate contractors.
2. Schedule delivery of Owner supplied products.
3. Obtain and provide to Contractor shop drawings, product data, and installation instructions for Owner supplied products.
4. Arrange and pay for delivery of Owner supplied products to site.
5. Submit claims for transportation damage and replace damaged, defective,or deficient items.

G. Contractor's responsibilities:

1. Participate in coordination of work with other installers, including Owner’s own

forces and separate contractors.
2. Inform Owner of required delivery dates for Owner supplied products and installation dates for work by others.
3. Review shop drawings,product data,and installation instructions; coordinate installation with other work; and provide blocking and other preparation required for Owner supplied products.
4. Unload Owner-supplied products required to be installed by Contractor at site and inspect for completeness and damage. Assemble, finish and install products as indicated by Contract Documents.
5. Repair or replace items damaged after receipt.

1.5. WORK SEQUENCE

A. Refer to Document 00 2000 – Request for Proposals.

B. Coordinate construction schedule and operations with Owner and Design Professional.

1.6. CONTRACTOR USE OF SITE

A. Existing building and site will not be occupied during construction.

B. Contractor will have restricted use of site to allow [Owner occupancy], [Owner to conduct normal operations], [installations by others], and [construction by others].

******* List restrictions and limitations on Contractor's use of site.*******

1. Access to site by trucks, equipment, and automobiles: Limited to route and entrances designated in Section 01 5000 – Temporary Facilities and Controls. Schedule construction traffic and material deliveries to site
2. On-site construction vehicle and equipment traffic shall be limited to pathways, areas and time periods approved in advance by Owner to ensure safe site conditions. Special care shall be taken during change of class periods, student arrival/departure times and around playgrounds, bus zones and established student pathways. The Contractor shall strictly maintain close communication with owner on mattersof on-site construction traffic scheduling and promptly inform them in advance of any significant changes to related pre-authorized arrangements. Do not proceed with altered arrangements prior to designated school representative(s) approval.
3. Parking: Contractor and work force may use designated portions of existing parking lots. [Do not interfere with Owner's parking requirements.]
4. Unless otherwise agreed to in advance by Owner, construction shall be performed only during these time periods:
   [Normal weekday work hours].
5. Construction activities shall be limited to areas of actual construction. Unless otherwise agreed to in advance by Owner, restrict workmen from entering adjacent restricted areas.
6. Existing student and staff toilet rooms are off-limits to Contractor unless they are not available for use by the school due to the approved schedule of work.

C. Contractor shall make arrangements with Owner to secure any keys necessary for

access to existing building and site areas so that the work can be performed. The Contractor assumes sole responsibility for the security and use of school keys obtained from the Owner and shall not reproduce them or lend them out during the progress of the work.

D. Comply with Owner's procedures for individual visual identification of Contractor's workforce on school site and in occupied areas. If identification badges are required make sure that they are worn at all times on site during the work.

E. Do not allow dust and debris to blow onto adjacent or restricted areas.

F. Provide 72 hours notice to Owner for any work that may interrupt or otherwise impact the facility's normal operations including noisy and dust or odor producing activities.

G. Emergency exits shall be maintained during construction in a manner satisfactory to the Architect, Owner and local officials having jurisdiction over emergency procedures and fire safety at the school. Notify Architect and Owner of any proposed modifications to emergency exits in advance of making changes due to construction.

H. Utility outages and shutdowns:

1. Maximum allowable duration: 4 hours or as approved in advance by Owner.
2. Coordinate all utility shutdowns which affect the operation of the school and neighbors with the Architect, Owner and any entity having jurisdiction over or ownership of impacted public or private utility infrastructure.
3. Schedule outages during off hours to facilitate Owner's operations.
4. Submit written request for outage to Architect 72 hours before anticipated outage. Outage must be approved in writing by Design Professional.

I. Owner reserves right to place and install equipment and furnishings in completed areas of building prior to Substantial Completion, provided such occupancy does not interfere with construction. Placing f equipment and furnishings does not constitute Substantial Completion of any portion of the Work. An inspection by Contractor, Owner and Architect shall be made prior to such limited occupancy solely for the purpose of establishing the condition of finishes and other items that might be damaged or obscured by placement and installation of Owner's items.

1.7. IDENTIFICATION OF ENTITIES

A. Where the term "Design Professional" is used in the Contract Documents it is defined as the authorized representative designated by Owner and acting within the scope of the particular duties entrusted to such representative.

1. Design Professional: [Mark Rea Baker, AIA]
2. Project Architect: [Tomas Sanchez]
3. Address: [505 Central Avenue NW, Suite E]
   [Albuquerque, NM 87102]
4. Telephone number: 505-[254-4697]

5. E-mail address:[sanchez@bakerad.com]

B. Where the term "Owner" is used in the Contract Documents, it is defined as New Mexico Highlands University.

1. School District Contact (Facilities Director): [Sylvia Baca]
2. Address: [PO Box 9000 Las Vegas, NM 87701]
3. Telephone number: [505-426-2048].
4. FAXnumber: [505-454-3120]
5. E-mail address: [sbaca@nmhu.edu].

1.8. DEFINITIONS

A. Refer to Document 00 7000 – General Conditions, Article1.1 for definitions of terms used within Contract Documents.

B. Additional terms used within Specifications but not defined by Document 00 7000 – General Conditions shall have the following definitions:

1. Products: Materials, manufactured items, components, fixtures, machinery, equipment, or systems forming the Work but not including machinery, equipment, and other aids used for preparing, fabricating, conveying, and installing the Work.
2. Supply: Furnish, deliver, and unload at Project site. Same meaning as furnish.
3. Furnish: Supply, deliver, and unload at Project site.Same meaning as supply.
4. Install: Operations at Project site to incorporate products into the Work such as unpacking, assembling, anchoring, erecting, applying, placing, curing, finishing, and preparing for use.
5. Provide: To supply or furnish a product and to also install it.
6. Execution: Operations at Project site including preparatory actions, installing, and post-installation adjusting, testing, cleaning, and demonstrating.

1.9. ABBREVIATIONS

A. Abbreviations used within the Specifications are defined as follows.
For abbreviations not listed, contact Architect for definitions.

ASTM -American Society for Testing and Materials.
ANSI -American National Standards Institute.
CF -Cubic feet.
CFM -Cubic feet per minute.
F -Fahrenheit.
LF -Linear feet.
LB -Pound.
MPH -Miles per hour.
SF -Square feet.
SY -Square yards.
PSI -Pounds per square inch.
PSF -Pounds per square foot.
RPM -Revolutions per minute.

SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes procedures for:

1. Schedule of Values.
2. Applications for Payment.
3. Contract modifications.
4. Unit prices, if any.

SCHEDULE OF VALUES

B. Procedures:

1. Submit for review by Design Professional 3 copies of preliminary Schedule of Values within 7 days after date of Agreement Between Owner and Contractor.
2. Revise to address review comments and resubmit.
3. Final Schedule of Values: Revise Schedule to incorporate review comments and submit 3 copies at least 7 days before submittal of initial Application for Payment.
4. During construction, revise and resubmit 3 copies of Schedule of Values to incorporate approved Change Orders.

C. Format: Typed schedule on standard form or electronic media printout approved by Design Professional. Sum of all values shall equal total Contract Sum.

D. Content: Use Project Manual Table of Contents as basis for line items. Cross reference line items with number and title of corresponding specification section. Provide sufficient detail to allow computation of values for progress payments during construction.

1. Include within each line item a directly proportional amount of Contractor's overhead and profit.
2. Provide separate line items for materials and for installation when materials will be stored on site prior to installation such that cost of stored materials will be included separately on an Application for Payment.
3. Provide separate line items for:

a. Each allowance included in Contract Sum.
b. Each additive alternate selected by Owner.
c. Each Contract modification.
d. For bonds.

e. Insurance.
f. Documentation and Closeout
g. New Mexico gross receipts tax.

1.3 APPLICATIONS FOR PAYMENT

A. Format: AIA Form G702 - Application and Certificate for Payment and AIA G703 or alternative form approved by Design Professional - Continuation Sheet or Contractor's electronic media driven form as approved by Design Professional.

B. Payment period: Monthly or as otherwise stipulated in Document 00 5000 – Agreement Between Owner and Contractor.

C. Preparation:

1. Use Schedule of Values for listing items in Applications for Payment.
2. Complete each entry on Application of Payment form. Incomplete forms will be returned without action.
3. List each authorized Change Order as a separate line item and in same format as other line items.
4. Provide subtotals and total.
5. Indicate total percentage of all work completed as of the date of the Application.
6. Applications shall be signed and dated by authorized officer of Contractor. Signature shall be notarized.

D. Include with Application for Payment appropriate invoices for materials stored on site.

E. At request of Design Professional, provide substantiating data justifying dollar amounts in question.

F. Submittal: Submit 3 executed copies of each Apllication for Payment.

1. Initial Application for Payment: Submit after the following have been submitted and accepted by Design Professional and Owner.

a. Certificates of insurance required by Document 00 7000 – General Conditions of the Contract.
b. Copy of building permit.
c. Schedule of Values as required by Paragraph 1.2.A.
d. Progress schedule as required by Section 01 3100 – Project Management and Coordination.
e. Submittal schedule as required by Section 01 3300 – Submittal Procedures.

2. Subsequent Applications for Payment:

a. Submit with Application of Payment:

1) Include the Updated Progress Schedule specified in Section 01 3100 – Project Management and Coordination.
2) Updated Submittal Schedule specified in Section 01 3300 – Submittal Procedures.

b. Prior to acceptance of each Application for Payment, Design Professional will review Project Record Drawings specified in Section 01 7800 – Closeout Submittals to ensure that recorded data is current.

3. Application of Payment at Substantial Completion: Submit after issuance of Certificate of Substantial Completion and in accordance with Section 01 7700 – Closeout Procedures.

4. Final Application for Payment: Submit after completion of final cleaning, final inspection, final submittals, and other final completion procedures specified in Section 01 7700 – Closeout Procedures.

1.4 CONTRACT MODIFICATION PROCEDURES

A. Changes in the Work shall be determined and Change Orders executed in accordance with Document 00 7000 – General Conditions.

1. Minor changes: Design Professional will advise of minor changes in Work not involving adjustment to Contract Sum or Time by issuing supplemental instructions on AIA Form G710.

2. Design Professional requested Change Order: Design Professional may issue a Modification/Change Request (MCR) with detailed description of proposed change and supplementary drawings and specifications as required.

3. Contractor proposed Change Order: Contractor may propose change by submitting a Modification/Change Request to Design Professional (MCR) describing proposed change, reason for change, and its effect on Contract Sum and Time. Completed MCR Worksheet(s) shall be provided by Contractor for each MCR to facilitate checking of itemized costs and percentages (copy of Form 01 2010 MCR Worksheet included after this Section). Document requested substitutions in accordance with Section 01 6300 – Product Substitution Procedures.

4. A Modification/Change Request signed by the Owner for subsequent inclusion in a Change Order may instruct Contractor to proceed with a change in the Work. Document will describe changes and designate method of determining changes in Contract Sum and Time.

B. Documentation: Maintain adequate records and provide full information required for evaluation of proposed changes and to substantiate costs. The Contractor shall provide:

1. Itemized product, labor, and equipment quantities and costs.
2. Amounts for taxes, insurance, and bonds.

3. Overhead and profit amounts.
4. Justification for changes in Contract Time.
5. Documented credits for deletions.

C. Methods for determining adjustments to Contract Sum:

1. Stipulated sum: Based on Design Professional's Modification/Change Request (MCR) and Contractor's price quotation or Contractor's MCR as approved by Design Professional. Completed MCR Worksheet(s) shall be provided by Contractor for each MCR to facilitate checking of itemized costs and percentages (copy of Form 01 2010 MCR Worksheet included after this Section).

2. Unit prices: Computed from unit prices stated in Contract Documents or subsequently agreed upon and actual measured quantities installed.

3. Time and material: Maintain detailed records for work performed on time and material basis. Submit itemized account and full supporting data after completion of change within stated time limitations. Design Professional will determine allowable change in Contract Sum and Time. Supporting data shall include as follows:

a. Names of personnel performing work.
b. Dates and times work was performed and by whom.
c. Time records and wage rates paid.
d. Invoices for products, equipment, and subcontracts.

D. Revision of documents: After authorization of Change Order revise:

1. Schedule of Values and Application for Paymnt forms to record each Change Order as a separate line item and adjust Contract Sum and Time.
2. Progress Schedules to reflect changes in Contract Time and to adjust times for other work items affected by changes. Resubmit revised schedule.
3. Record changes in Project Record Documents.

1.5 UNIT PRICE PROCEDURES

A. Prices: Certain Items of work are to be bid as unit prices. Prices are to include all necessary material, labor, equipment, overhead, profit, insurance, applicable taxes, and bond.

B. Quantities: Quantities set forth in the Bid Form are estimates on which bids will be compared and the Contract Sum determined.

1. If actual work requires more or fewer of an indicated quantity, provide the required quantity at the established unit price.

2. Owner reserves the right to increase or decrease quantities by 15 percent.

3. If actual work requires a change in a Contract unit price quantity exceeding plus or minus 15 percent, Owner or Contractor may request that an adjustment of the unit price be negotiated.

C. Measurement: Take all measurements and compute quantities. Design Professional will verify measurements and quantities. Measurement of quantities shall be by weight, volume, area, linear measurement, number of items, or other methods as described in individual sections.

D. Payment: Payment will be made for work actually performed and will be computed by multiplying verified quantity by unit price.

E. Adjustment: The final Contract Sum will be adjusted by Change Order to reflect actual approved quantities for unit price items.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

MODIFICATION / CHANGE REQUEST NO._____ DATE OF REQUEST:_____

PROJECT NO. _____

DESCRIPTION OF PROPOSED WORK:

NOTE: Fill out a separate worksheet for each subcontractor on this MCR. The GC shall use this same form to summarize the total of all subcontractor proposals while adding GC costs. Attach all worksheets and breakdowns to summary sheet for each MCR.

SUBCONTRACTOR'S COSTS (ATTACH SUBCONTRACTOR'S SHEET AND COST BREAKDOWNS):*

1	Total of subcontractor's material (attach itemized breakdown):	$
2	Total of subcontractor's labor cost including fringe benefits and labor burden (attach itemized breakdown):	$
3	Other directly attributable costs allowed (attach itemized breakdown):	$
4	Subtotal:	$
5	Subcontractor's O&P _____%:	$
6	Subcontractor's Bond:	$
7	Permits paid by subcontractor:	$
8	Subcontractor's Total Costs:	$

GENERAL CONTRACTOR'S COSTS (ATTACH WORKSHEETS)*

9	GC's material (attach itemized breakdown):	$
10	General Contractor's labor cost including fringe benefits and labor burden @_____% (attach itemized breakdown):	$
11	Construction equipment (rental).	$
12	Directly attributable field supervision, insurance, etc. (attach itemized breakdown):	$
13	Subtotal:	$
14	General Contractor's Overhead $ Profit on subcontractor (% of Item 8):	$
15	General Contractor's Overhead & Profit on work by General Contractor's forces (% of Item 13):	$
16	Subtotal (sum of Items 13, 14 and 15):	$
17	Bond (% of Item 16):	$
18	Permits paid by General Contractor:	$

19	Subtotal (sum of Items 8, 16, 17 and 18):	$
20	Gross Receipts Tax _____% of Line 19:	$
21	General Contractor's total cost (sum of Lines 19 and 20):	$

*** Allowable costs and percentages shall not exceed those indicated in Article 7.2.5.**

SECTION 01 2300

BID LOTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Procedures and descriptions for Bit Lots which may increase scope of project.

1.2 CONDITIONS

A. All requirements of General and Supplementary Conditions, applicable sections of Specifications, and applicable portions of Drawings shall govern scope, quality, and execution of alternates.

B. Bid Lots will be selected as allowed by available funding.

1.2 BID LOT SCHEDULE

A. See Sheet G-002 for Bid Lot Schedule.

1.3 PROCEDURES

A. Consider all work that must be accomplished for complete incorporation of Bid Lots including modifications to Base Bid items.

B. Include in lump sum prices for Bid Lots all costs of labor, materials, equipment, permits, fees, insurance, bonds, overhead, and profit.

C. Immediately after award of Contract, advise all necessary personnel and suppliers as to which Bid Lots have been selected by Owner. Use all means necessary to alert those personnel and suppliers involved as to all changes in the work caused by Owner's selection or rejection of Bid Lots.

D. Coordinate related work and modify surrounding work to integrate work of each Bid Lot.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes:

1. General requirements for coordination of Work.
2. Field engineering.
3. Construction Coordination
4. Requirements for participation in and administration of:

   a. Pre-construction conference.
   b. Progress meetings.
   c. Pre-installation conferences.

5. Progress schedule.
6. Construction photographs.

B. Related documents and sections:

1. Section 00 2000 – Request for Proposals.
2. Section 01 1000 – Summary: Work by others.

1.2. SUBMITTALS

A. Provide in accordance with Section 01 3300 – Submittal Procedures:

1. Coordination drawings:

   a. Provide where coordination is critical for installation of components fabricated off site and where space is limited and maximum utilization of space is required.
   b. Show relationship and integration of components and construction entities, required installation sequence, dimensions, and tolerances.

B. Staff assignment list:

1. Prior to Pre-Construction Conference, provide to Design Professional a list of Contractor's principal staff assignments for Project. Indicate names, duties and responsibilities, addresses, emergency contact information and telephone numbers. Include resume of proposed Project Superintendent showing prior experience as superintendent on projects of similar size and scope. Naming more than one Project Superintendent to be in charge depending which is present at the site will not be acceptable. Design Professional shall be informed in writing prior to any proposed change in Project Superintendent during the progress of the Work.
2. Distribute contact information and post in field office coordination.

1.3. GENERAL COORDINATION REQUIREMENTS

A. Scheduling: Coordinate scheduling, submittals and work of various specification sections to ensure efficient and orderly sequence of installation of interdependent construction elements. Ensure that work of one specification section is not installed in such a manner as to limit, preclude, or restrict work of another section.

B. Coordinate completion and clean up of work of separate specification sections in preparation for final inspection specified in Section 01 7700 – Closeout Procedures.

C. After acceptance of Work, coordinate access to facility for required maintenance, monitoring, adjusting, and correcting deficiencies to manner to minimize disruption of Owner's activities.

D. Coordinate with Owner regarding work of Owner’s forces and separate contractors. Ensure coordination of such work with Project Schedule.

1.4. FIELD ENGINEERING

A. Existing control datum for field engineering is indicated on Drawings.

B. Locate or establish survey control and reference points prior to starting site construction. Protect points during construction and record locations with horizontal and vertical data on Project Record Documents in accordance with Section 01 7800 – Closeout Submittals.

C. Prior to start of construction, verify location of control points and layout information on Drawings relative to property, setback, and easement lines.

D. Provide competent field engineering services. Establish elevations, lines, and levels utilizing recognized engineering survey practices. Periodically verify layouts.

E. Promptly replace dislocated control and reference points based on original survey control.

1.5. CONSTRUCTION COORDINATION

A. Contractor shall at all times be present at the Work in person, or represented by a competent superintendent who shall supervise and direct the Work, and shall be authorized by the Contractor to receive and fulfill instructions from the Design Professional and/or Owner.

B. Contractor shall, at all times during working hours, be represented in all matters pertaining to the project by one, and only one, fully competent and experienced general superintendent. Instructions and information given by the Design Professional and/or Owner to the Contractor’s superintendent shall be considered as having been given to the Contractor.

C. Before any Work is done at the job site, Contractor shall give written notice to the Design Professional and Owner stating who the Contractor’s superintendent will be, giving his home address and telephone number. The Design Professional and Owner

shall be informed in writing prior to any change of general superintendent. A statement naming more than one representative at a time to be in charge and depending upon which is present at the time will not be acceptable.

D. Verify that characteristics of elements of interrelated operating equipment are compatible and coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. With regards to pre-existing improvements or work in place which is not part of the Work under the Agreement, Contractor shall make proper connections with existing services, utilities, pavements and grades as indicated and provide all necessary materials, equipment, anchors, fastenings, etc. required for connections

1.6. PRE-CONSTRUCTION CONFERENCE

A. Conference will be held after execution of the Agreement and prior to issuance of Notice To Proceed. Time and location will be coordinated with Owner and Design Professional. Meet at the site or other location convenient to all parties.

B. Attendance: Owner, school principal or other designated school representative, Design Professional, consultants, Contractor, and major subcontractors and suppliers.

C. Agenda Topics:

1. Distribution of Contract Documents.
2. Designation and description of roles of responsible personnel representing Owner, Contractor, and Design Professional.
3. Status of permits and Notice to Proceed.
4. Use of premises by Contractor and Owner, Owner's occupancy requirements, work hours, regular school schedule and special school schedule considerations.
5. Construction schedule, work sequence, and delivery priorities.
6. Weekly job meeting schedule.
7. Owner’s right to salvage.
8. Presentation and discussion of site mobilization plan specified in Section 01 5000 – Temporary Facilities and Controls.
9. Construction facilities, controls, and temporary utilities.
10. Procedures for processing submittals, applications for payment, substitution requests, field decisions and communications, and contract modifications.
11. Testing and Inspections.
12. Wage rates.
13. Security, Contractor’s use of keys, safety, first aid, and housekeeping.
14. Behavior of work force on school site.
15. Procedures for spotting of utility lines.
16. Procedures for maintaining project record documents.
17. Requirements for start up of equipment.
18. Testing and inspection procedures.
19. Inspection and acceptance of equipment put into service during construction.
20. Contract closeout procedures.
21. Other pertinent items.

1.7. PROGRESS MEETINGS

1. Schedule and administer construction progress meetings throughout progress of Work. Meetings shall be held bi-weekly or more frequently as required. Location of meetings to be on site or other location approved by Design Professional.
2. Make arrangements for meetings, prepare agenda, and distribute notice of meetings to participants, Design Professional, and Owner 3 days in advance of meeting.
3. Preside at meetings. Record minutes and distribute copies within 3 days after meeting to participants, entities affected by meeting decisions, Design Professional, and Owner.
4. Attendance: Contractor, job superintendent, and subcontractors and suppliers as appropriate to agenda. Owner representative, Design Professional, and consultants may attend as appropriate.
5. Prepare agenda to cover topics pertinent to continued progress and successful completion of Work. Suggested topics:

    a. Review previous meeting minutes.
    b. Review schedules and progress, identify impediments, and determine measures to maintain schedules.
    c. Review field observations, problems, and decisions.
    d. Review status of submittals.
    e. Review off-site fabrication and delivery schedules.
    f. Quality control.
    g. Review proposed MCRs and pending proposals from Contractor including impact on schedule.

1.8. PRE-INSTALLATION CONFERENCES

A. When required by an individual specification section, convene a pre-installation conference at site.

B. Require attendance of entities directly concerned with item of work.

C. Notify Design professional 4 days in advance of meeting.

D. Prepare agenda and preside at conference. Record minutes and distribute copies within 3 days to participants and Design Professional.

E. At meeting, review conditions of installation, preparation and installation procedures, and coordination with related work.

1.9. PROGRESS SCHEDULE

A. Format: Horizontal bar chart:

1. Approximate sheet size: 17 by 28 inches.
2. Provide separate bar for each major item of Work. Arrange in sequence and identify bars with specification section numbers and titles from Project Manual Table of Contents.
3. Horizontal scale: Time with first work day of each month identified. Adjust scale to show entire construction period plus extensions.

4. Vertical spacing: Allow space for notations and revisions.

B. Show complete sequence of construction by activity. Indicate:

1. Dates for beginning and completion of each construction item.
2. Projected percentage of completion for each item as of first work day of each
3. Projected percentage of completion for total Work as of first day of each month.
4. Required dates for return of specific submittals and for selection of finishes

C. Procedures:

1. Submit for review by Design Professional 3 copies of preliminary Progress Schedule within 20 days of date of Agreement between Owner and Contractor but no later than submission of first payment application.
2. Revise to address review comments and resubmit.
3. Update Progress Schedule and submit 3 copies with each Application for Payment.
4. Identify progress of each activity to date of submittal and projected completion date.
5. Show activities modified since last submittal and other identifiable changes.
6. Provide narrative report as needed to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken or proposed and its effects.

PART 2 - PRODUCTS

2.1. EQUIPMENT

A. Verify utility requirements and characteristics of equipment are compatible with facility utilities. Coordinate work of various specification sections having interdependent requirements for installing, connecting to, and placing in service such equipment.

PART 3 - EXECUTION

3.1. INSTALLATION

A. Space requirements:

1. Coordinate space requirements and installation of mechanical, electrical, and other work shown diagrammatically on Drawings. Follow routing shown for pipes, ducts, and wireways as closely as practicable. Utilize spaces efficiently to maximize accessibility for other installations, maintenance, and repairs.
2. Where space is limited, coordinate installation of components to ensure maximum access for maintenance. Ensure space provided around equipment and fixtures complies with applicable codes.

B. Concealment: In finished areas, conceal pipes, ducts, and wireways within construction except as otherwise indicated. Where practical, conceal supports, fasteners, and other attachment devices.

C. Arrangement:

1. Unless otherwise indicated, installations shall be aligned vertically and horizontally. Place piping, conduit, wireways, and other linear items parallel with lines of building.
2. Coordinate mounting heights and spacing of components so that finished work is neat and orderly with organized appearance.
3. Repetitive items such as hangers and fasteners shall be equally spaced unless indicated otherwise.

D. Blocking, anchors, and supports: Determine and coordinate requirements for blocking, anchors, and supports needed for proper installation of products. Provide necessary components whether or not indicated on Drawings or specified.

E. Finished surfaces: Coordinate locations of fixtures, boxes, and other recessed or surface mounted items with finish elements and grades to ensure proper installation and neat appearance.

3.2. COORDINATION WITH INSTALLED CONSTRUCTION

A. Openings made in installed exterior surfaces shall be closed to protect construction from weather and extremes of temperature and humidity.

B. Cutting and patching of installed construction shall be accomplished in accordance with Section 01 7000 – Execution Requirements.

C. Remove, cut, and patch previously installed construction in a manner to minimize damage and to provide a means of restoring finishes to original or better condition.

D. Where refinishing is required, provide a neat transition to adjacent surfaces.

E. Patched work shall match existing adjacent work in texture and appearance.

END OF SECTION

SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes submittal procedures for:

1. Shop drawings.
2. Product data.
3. Samples.
4. Manufacturer's instructions.
5. Design data and calculations.
6. Manufacturer's certificates.
7. Reports for testing, inspecting, and demonstrating.
8. Refer to individual specification sections for unique submittal requirements related to a specific product.

1.2. SUBMITTAL SCHEDULE

A. Procedure:

1. Submit for review by Architect 3 copies of Submittal Schedule within 20 days of date of Agreement Between Owner and Contractor but no later than Notice to Proceed.
2. Revise to address review comments and resubmit.
3. Update Submittal Schedule to reflect change orders, Progress Schedule revisions, and status of individual submittals. Submit 3 copies with each Application for Payment.

B. Format: Tabular arrangement indicating:

1. Submittal number and title.
2. Related specification section number and title.
3. Proposed submittal date, actual submittal date, and date reviewed submittal is required.

1.3. SUBMITTAL PROCEDURES

A. Schedule submittals to expedite Work. Unless otherwise noted, submittals shall be submitted within 45 days of date of Agreement between Owner and Contractor.

B. Preparation:

1. Provide separate submittal for each specification section requiring submittals. Include all material requested for that section. Provide folders or binders for material.
2. Coordinate submission of related items. Group submittals of related products or a system in a single transmission.
3. Identify variations from requirements of Contract Documents. State product and system limitations which may adversely affect Work.
4. Mark or show dimensions and values in same units as specified.
5. Provide 4 by 6 inches minimum space for Architect and Contractor review stamps.

C. Contractor review:

1. Review submittals prior to transmittal. Verify compatibility with field conditions and dimensions, product selections and designations, and conformance of submittal with requirements of Contract Documents. Return non-conforming submittals to originator for revision rather than submitting to Architect.
2. Coordinate submittals to avoid conflicts between various items of work.
3. Apply Contractor's stamp with signature certifying that review, verification of products required, field dimensions, adjacent construction, and coordination of information is in accordance with the requirements of the Contract Documents.
4. Failure of Contractor to review submittals prior to transmittal to Architect shall be cause for rejection.

D. Transmittal:

1. Transmit each submittal with a separate Submittal Transmittal Form. Copy of Form follows this Section.
2. Sequentially number transmittal forms. Re-submittals shall have original number with an alphabetic suffix.
3. Identify project, Contractor, subcontractor, supplier, pertinent drawing sheet and detail numbers, and sassociated specification section numbers.
4. Sign Submittal Transmittal Form and deliver submittals to Architect.

E. Review: architect will review and return submittals with comments.

F. Do not fabricate products or begin work which requires submittals until return of submittal with Architect acceptance.

G. On return promptly distribute reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

H. Resubmission:

1. Revise and resubmit submittals as required within 15 days of return from Architect.
2. Make re-submittals under procedures specified for initial submittals.
3. Identify all changes made since previous submittal.

1.4. SHOP DRAWINGS

A. Submission:

1. Submit one reproducible transparency and 3 copies to be retained by Architect.
2. Fold drawings to fit submittal folders.

B. Form:

1. Size: 8-1/2 by 11 inches minimum and 36 by 48 inches maximum except for full size details and templates.
2. Present in a clear and thorough manner. Title each drawing with Project name. Identify each element of drawing with reference number.
3. Plans, elevations, sections, and detail shop drawings shall be to scale with scale indicated.
4. Indicate field verified dimensions. Show relationship of products to adjacent work. Note coordination requirements.
5. Schematics and wiring and other diagrams shall be logically arranged and presented in a clear understandable manner with all items labeled.

1.5. PRODUCT DATA

A. Submission: Submit the number of copies which Contractor requires plus 3 copies to be retained by Architect.

B. Form:

1. Provide all critical information such as reference standards, performance characteristics, capacities, power requirements, wiring and piping diagrams, controls, component parts, finishes, dimensions, and required clearances.
2. Submit only data which are pertinent. Mark each copy of manufacturer's standard printed data to identify products, models, options, and other data pertinent to project.
3. Modify manufacturer's standard schematic drawings and diagrams and supplement standard data to provide specific information applicable to project. Delete information not applicable.
4. Colors and patterns: Unless color and pattern is specified for product, submit accurate color and pattern charts or samples illustrating manufacturer's full range for selection by Architect. Submit for Architect’s review accurate color and pattern samples as required for specified colors.

1.6. SAMPLES

A. Submission:

1. Submit the number of samples specified in individual specification sections. One sample will be retained by Architect.
2. Label each sample with identification related to Submittal Transmittal Form.
3. Submit samples at least 30 days prior to date Contractor needs approval for ordering or incorporation into Work.

B. Type: Submit samples to illustrate functional and aesthetic characteristics of the products, with all integral parts and attachment devices. Include full range of manufacturer's standard finishes, indicating colors, textures, and patterns for Architect selection.

C. Reviewed product samples may be used in work with approval of Architect.

1.7. MANUFACTURER'S INSTRUCTIONS

A. Submission: Submit the number of copies which Contractor requires plus 3 to be retained by Architect.

B. Form:

1. Manufacturers' printed instructions for activities such as delivery, storage, assembly, installation, wiring, start-up, adjusting, finishing, and maintaining.
2. Indicate pertinent portions and identify conflicts between manufacturers' instructions and Contract Documents.

1.8. DESIGN DATA AND CALCULATIONS

A. Submission: Submit the number of copies which Contractor requires plus to be retained by Architect.

B. Form:

1. Provide basic calculations, analyses, and data to support design decisions and demonstrate compliance with specified requirements. State assumptions and define parameters. Give general formulas and references. Provide sketches as required to illustrate design method and application.
2. Arrange calculations and data in a logical manner with suitable text to explain procedure.
3. Indicate name, title, and telephone number of individual performing design and include professional seal of designer where applicable or required.

1.9. MANUFACTURERS' CERTIFICATES

A. Submission: Submit the number of copies which Contractor requires plus 3 to be retained by Architect.

B. Form:

1. Certificates shall indicate that products conform to or exceed specified requirements. Submit supporting reference data, affidavits, and certifications as required.
2. Certificates may be based on recent or previous test results if acceptable to Architect.

1.10. REPORTS

A. Submission:

1. Submit the number of copies which Contractor requires plus 3 to be retained by Architect.
2. Submit reports within 15 days after completion of activity.

B. Form:

1. Present complete information in a clear concise manner.
2. Typed or computer printed on 8-1/2 by 11 inch white paper.
3. Bind with titled cover in folder, plastic binder, or three ring binder as appropriate for quantity of material.

C. Reports shall include:

1. Time, location, conditions, and duration of activity.
2. Names of persons performing and witnessing activity.
3. Equipment used.
4. Description of activity, data recorded, and results.
5. Deficiencies found, corrective measures, and results of retesting.
6. Other pertinent data.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SUBMITTAL TRANSMITTAL FORM

The undersigned, as Contractor for the above project, submits the following and certifies that submittal has been reviewed and it conforms with requirements of Contract Documents except as noted.

SUBMITTAL NUMBER:_____ _____RESUBMITTAL:YES NO

DATE:_____NUMBER OF COPIES SUBMITTED:_____

DESCRIPTION:_____

ASSOCIATED SPECIFICATION SECTION NO:_____

REFERENCED DRAWING SHEET NO:_____

NAME OF SUBCONTRACTOR/SUPPLIER:_____

SUBMITTED BY:_____DATE:_____

SIGNATURE:_____

DATE RECEIVED BY ARCHITECT:_____

DISTRIBUTED TO:

OWNER CIVIL LANDSCAPE STRUCTURAL MECHANICAL ELECTRICAL

OTHER:_____

* *

ACTION:

No exceptions taken

_____

Make corrections noted

_____

Revise and resubmit

_____

Rejected

_____

COMMENTS:

_____

_____

_____

Submittal review corrections and comments by Architect do not relieve Contractor from compliance with Contract Documents. Review is only for general conformance with design concept and general compliance with information given in Contract Documents. Contractor is responsible for verifying dimensions, selecting fabrication processes and techniques of construction, coordination with other trades,and performing work in safe and satisfactory manner.

REVIEWED BY:_____DATE:_____

SIGNATURE:

_____

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes:

1. Installation quality control.
2. Reference standards.
3. Mock-ups.
4. Field samples.
5. Inspection and testing laboratory services.
6. Manufacturer's field services and reports.

1.2. INSTALLATION QUALITY CONTROL

A. Monitor and maintain quality control over manufacturers, suppliers, subcontractors, work force, site conditions, products, and services to ensure Work is of specified, consistent quality.

B. Workmanship:

1. Specified requirements represent a minimum acceptable quality for Work. Comply with industry standards except when more stringent specified requirements and tolerances indicate higher standards or more precise workmanship.
2. Perform work with suitable qualified personnel to produce work of specified quality.
3. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and distortion.

C. Manufacturer's instructions:

1. Comply fully with manufacturer's instructions. Perform steps in manufacturer's recommended sequence.
2. Should instructions conflict with Contract Documents, request clarification from Architect before proceeding.

1.3. REFERENCE STANDARDS

A. When specifications require conformance to a reference standard, applicable standard shall be the edition current at date of receiving bids.

B. Should specified reference standard conflict with Contract Documents, request clarification from Architect.

C. Contractual relationship, duties, and responsibilities of the parties to the Contract nor those of Architect shall not be altered from that stated in the Contract Documents by mention or inference to the contrary in a specified reference standard.

1.4. MOCK-UPS

A. When required by an individual specification section, construct mock-up of construction component or assembly.

B. Assemble and erect mock-up with specified attachments, anchorage devices, flashings, seals, and finishes.

C. Perform tests as specified in section requiring mock-up. Submit report in accordance with Section 01 3300 – Submittal Procedures.

D. Mock-up accepted by Architect shall represent quality level for that item of work.

E. After acceptance and use as quality standard, completely remove mock-up and clean area.

1.5. FIELD SAMPLES

A. When required by an individual specification section, install field samples for review by Architect.

B. Acceptable installed sample shall remain as part of Work and shall represent quality level for that item of work. Unacceptable sample shall be removed and replaced, repaired, or refinished as directed by Architect.

1.6. INSPECTION AND TESTING LABORATORY SERVICES

A. Unless required otherwise in the Contract, Owner shall appoint, employ, and pay for services of an independent firm to perform routine inspections and compliance for testing and inspection services as specified and/or as shown, including Special Inspections required by Authority Having Jurisdiction, and other materials, components, and systems where routine testing to determine compliance with Contract Documents is required.

B. Testing firm shall perform inspections, tests, and other services specified in individual specification sections and as required.

C. Testing firm shall submit copies of reports indicating observations and results of inspections and tests with indication of compliance or non-compliance with Contract Documents.

D. Contractor's responsibilities:

1. Cooperate with testing firm and furnish materials and other products to be tested. Provide assistance in accessing and obtaining samples. Provide storage for samples and testing equipment.
2. Notify testing firm 2 days prior to operations requiring testing services.
3. Make arrangements with testing firm and pay for additional samples and tests required for Contractor's use.

E. Retesting: Retesting required because of non-conformance to specified requirements shall be performed by same testing firm and paid for by Contractor.

1.7. MANUFACTURER'S FIELD SERVICES AND REPORTS

A. When required by an individual specification section, provide services of manufacturer's field representative to observe site conditions, installation, quality of workmanship, starting of equipment, testing and adjusting equipment, and as applicable, to instruct and supervise field operations.

B. Submit qualifications of manufacturer's field representative to Architect for approval 15 days in advance of required observation.

C. Manufacturer's field representatives shall report observations, site decisions, and instructions given to installers that are supplemental or contrary to manufacturer's written instructions.

D. Submit report of field representative within 30 days of observation and in accordance with Section 01 3300 - Submittal Procedures.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes:

1. Site mobilization plan.
2. Temporary services: Electrical, lighting, heating, ventilating,water, telephone, and facsimile.
3. Fencing, barriers, and other temporary controls.
4. Temporary dust, erosion and sediment controls including NPDES-SWPPP requirements.
5. Construction facilities: Temporary buildings, sanitary facilities, access, and parking.
6. Protection of Work and existing facilities.
7. Project sign.
8. Bulletin board.

1.2. REFERENCES

A. NFPA10-Standard for Portable Fire Extinguishers.

B. NFPA241- Safeguarding Building Construction, Alterations,and Demolition Operations.

1.3. SITE MOBILIZATION PLAN

A. Coordinate locations for temporary facilities with Architect and Owner.

B. Based upon information indicated on Drawings,prepare site mobilization plan showing:

1. Field office.
2. Storage areas,sheds,and fencing.
3. Project identification sign.
4. Access routes.
5. Temporary utility routes and connections.
6. Sanitary facilities.
7. Trash and rubbish receptacles.
8. Parking arrangements.

C. Present 3 copies of plan at Pre-Construction Conference in accordance with Section 01 3100 – Project Management and Coordination.

D. Prior to mobilization,revise and resubmit to Architect site mobilization plan incorporating final revisions made at Pre-Construction Conference and approved by Architect and Owner.

1.4. TEMPORARY ELECTRICITY

A. Connect to existing power source at site. [Do not disrupt Owner's need for continuous service.]Provide service disconnect and over current protection. Provide temporary feeder as required. [Owner will pay cost of electricity used. Exercise measures to conserve power.]

B. Provide power outlets for construction operations with branchwiring,distribution boxes,and flexible power cords as required.

C. Permanent convenience receptacles may be utilized during construction.

1.5. TEMPORARY LIGHTING

A. Provide lighting for construction operations. Lighting levels shall be appropriate for type and difficulty of work. Use these minimums as guidelines:

B. After dark, provide security lighting for interior and exterior work and storage areas.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

D. Maintain lighting and provide routine repairs.

E. Permanent building lighting maybe utilized during construction.

1.6. TEMPORARY HEATING AND VENTILATING

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, and gases.

B. Provide temporary fan units to maintain clean air for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in interior areas where construction is in progress.

D. Use Owner's existing HVAC system to maintain specified conditions. Owner will pay cost of energy used. Exercise measures to conserve energy.

E. If Owner’s existing HVAC system is temporarily insufficient or inoperable due to the Work, provide and pay for supplemental heating devices needed to maintain specified conditions and in such a manner a to prevent damage to existing building and systems.

1.7. TEMPORARY WATER SERVICE

A. Connect to existing water source at site for construction operations. [Owner will pay cost of water used. Exercise measures to conserve water.]

B. Assume responsibility for temporary connections and waterlines. Upon completion, remove temporary facilities.

1.8. COMMUNICATIONS

A. Provide, maintain, and pay for telephone service to field office. School telephones will not be available to Contractor's workforce unless for an emergency.

B. Provide, maintain, and pay for facsimile service to field office.

1.9. FENCING

A. Provide temporary fencing around new building and materials storage site. Completely separate construction from existing facilities, student pathways and related exterior areas.

B. Type: Panelized 6 foot high commercial grade chain link fence. Equip with vehicular and pedestrian gates with locks.

1.10. BARRIERS AND PROTECTION

A. Security: Provide to protect Work [and existing facilities] from unauthorized entry, vandalism, and theft. [Coordinate with Owner's security program and personnel.]

B. Barriers: Provide to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from construction operations.

C. Barricades and covered walkways: As required by Architect, Owner and governing authorities for safe public access to existing buildings.

D. Enclosures: Provide temporary, insulated, weather tight closures of exterior openings to provide acceptable working conditions, protect Work, and prevent unauthorized entry. Fit with lockable doors.

E. Temporary partitions: Provide to separate work areas from [existing building at point of connection.] [completed Work.] Prevent penetration of dust and moisture into[existing] [completed portions of] building.

F. Emergency exits shall be maintained during construction. Provide separate barriers as appropriate.

G. Protect existing detection devices such as smoke detectors and sensors from construction dust.

H. Protect existing trees and plants designated to remain. Replace damaged plant material.

I. Hand-water existing trees, plants [and grass] as necessary to maintain them viable in the event that existing irrigation system is made temporarily inoperable due to the Work. Replace dead plant material as required in the event of failure to comply with this provision.

1.11. PROTECTION OF INSTALLED WORK

A. Protect installed Work. Control activity in immediate work area.

B. Provide temporary and removable protection for installed products.

C. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, and movement of heavy objects with durable sheet materials.

D. Prohibit traffic and storage on roof surfaces and landscaped areas.

1.12. TEMPORARY FIRE PROTECTION

A. Install and maintain temporary fire protection components. Establish and follow procedures to protect against fire losses. Comply with NFPA241.

B. Fire extinguishers: Provide hand carried, portable, UL rated fire extinguishers of type and size recommended by NFPA10 for building exposure conditions. Place in accessible,convenient locations in clear view with a minimum of one extinguisher per floor.

C. Access: Maintain unobstructed access to fire hydrants, water supply, fire extinguishers, stairways,and access routes for fighting fires.Heating devices: Exercise care and monitor use of temporary heaters to minimize fire risk.

D. Store combustible materials in fire-safe containers.

E. Volatile products: Do not store paints, varnishes, paint removers, solvents, adhesives, cleaning rags, and other volatile products in building. Take precautionary measures to prevent fire hazards and spontaneouscombustion.

F. Cutting and welding: Approve in advance use of open flame cutting,welding,and soldering equipment Ensure that safe conditions exist before granting approval.

1.13. TEMPORARY DUST, EROSION AND SEDIMENT CONTROLS

A. Prevent temporary collection of sediment on sidewalks, parking lots, streets and driveways. Clean such surfaces promptly if such conditions exist due to the Work.

B. National Pollution Discharge Elimination System (NPDES) permit and procedures for preparing a Storm Water Pollution Prevention Plan (SWPPP).

1. This Project requires an EPA NPDES storm water discharge permit in conformance with all federal, state, and county regulations governing the disturbance of construction site areas, and as a LEED pre-requisite (SSP1).
2. Both Contractor and Owner shall be designated as separate permittees and the Contractor shall do the following:

a. Prepare a Storm Water Pollution Prevention Plan (SWPPP) document as necessary to ensure compliance with any and all NPDES and Bernalillo County

construction storm water permitting plan requirements.

b. Prepare and submit to EPA and Bernalillo County documentation and forms required of Contractor for permit.

c. Assist Owner with preparation and submittal of all EPA documentation and forms specifically required of Owner for permit. Provide all required project-related information to Owner as necessary.

d. At Final Completion of Project, Contractor shall complete and submit documentation to EPA and Bernalillo County as required and to Architect as part of Project Closeout documentation package. See Section 017800 of Specifications.

3. The Contractor shall manage the discharge of storm water from the site in accordance with NPDES permit and the provisions of the SWPPP. The Contractor shall be responsible for installing and maintaining any necessary storm water control measures in accordance with control device manufacturer's recommendations and the provisions of the SWPPP. The Contractor shall monitor the suitability of the designated control measures and management practices to achieve the storm water quality provisions of the NPDES permit, and shall make any necessary changes to the controls and practices in order to meet the permit requirements. The Contractor shall be responsible for updating the SWPPP and maintaining all records related to the SWPPP. A copy of the approved SWPPP shall be kept on the job site at all times. Contractor shall be liable for all fines and construction delays resulting from any governmental agency enforcement action due to failure by the Contractor to satisfy the above requirements.
4. Contractor is responsible for payment of all application fees and permits related to SWPPP review and approval process and for full cost of control measures for the project.

C. Prevent fugitive dust from originating on and blowing from construction site in accordance with local ordinances and regulations. Failure to do so will subject the Contractor to payment of fines assessed against Owner by local agency having jurisdiction.

1.14. ACCESS

A. Refer to Drawings for location of acceptable access routes and site entrances. Protect existing curbs and walks traversed by construction vehicles from damage.

B. Identify access to Contractor's work and office area with appropriate signs so that delivery personnel and others may contact Contractor. School office shall not be used as destination for Contractor's deliveries.

C. Prevent unauthorized personnel from accessing school building or site through Contractor's work area.

1.15. FIELD FACILITIES

A. Provide and maintain a weather tight, fully equipped field office. [Provide work station for use of Architect during field inspections.]

B. Provide space for project meetings with table and chairs to accommodate minimum 6 persons.

C. Provide and maintain storage sheds and other facilities as required.

D. Arrange for parking for work force in manner approved by Owner. Do not limit Owner's requirements for parking.

1.16. TEMPORARY SANITARY FACILITIES

A. Provide and maintain required sanitary facilities for workforce.

B. New and existing toilet facilities shall not be used by work force.

1.17. DRINKING WATER

A. Provide independent source of drinking water for work force. School drinking fountains shall not be routinely available for Contractor's use.

1.18. PROJECT SIGNS

A. Furnish project sign and erect on site at location designated by Architect.

B. Construction: Refer to drawing attached to this Section.

C. Sign shall be prepared by professional sign painter using either painted exhibit lettering or die cut adhesive applied letters.

D. Design, style and sizes of lettering, color, and text shall be as shown on drawing attached to this Section; electronic PDF will be provided by Architect.

1.19. BULLETIN BOARD

A. Furnish and maintain bulletin board adjacent to field office. Display the following throughout construction period:

1. State wage rates.
2. Safety requirements.
3. Official notices and announcements.

1.20. REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade and buried utilities, equipment, facilities, and excess materials prior to final inspection.

B. Clean and repair damage caused by installation of temporary facilities.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes:

1. General product requirements.
2. Transportation and handling.
3. Storage and protection of products.

1.2. GENERAL PRODUCT REQUIREMENTS

A. Products shall be new and currently in production.

B. Do not use products removed from other facilities except where use of salvaged products is required in Contract Documents.

C. Products of the same category shall be products of a single manufacturer. Where possible, products under a single specification section shall be of the same manufacturer.

D. Only non-asbestos containing materials shall be used or incorporated in the Work.

1.3. TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, and damage.

D. Deliver packaged products in unopened and undamaged cartons and wrappings.

1.4. STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated products, place on supports above ground, sloped to drain.

C. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

D. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

E. Arrange storage of products to permit access for inspection. Periodically inspect to ensure products are undamaged and are maintained under specified conditions.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 6300

PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes requirements for product options and substitution procedures.

1.2. PRODUCT OPTIONS

A. For products specified by reference standards or by description only, provide any product meeting those standards or description.

B. For products specified by naming one or more manufacturers with the designation that no substitutions are allowed, provide only named products.

C. For products specified by naming one or more manufacturers, provide named products and approved substitute products listed in Addenda, or submit a request for substitution in accordance with Paragraph 1.3.

1.3. SUBSTITUTIONS

A. During bidding, Architect will consider written requests from qualified bidders, subcontractors, and manufacturers for substitutions.

1. Submit separate request for each substitution with Form 01 6310 – Prior Approval Substitution Request Form. Copy of form follows this Section.
2. Submit substitution request in accordance with procedures and time limitations stated in Document 00 2000 – Request for Proposals.
3. Substitutions approved during bidding will be listed in Addenda.

B. After Contract award:

1. After signing of Agreement Between Owner and Contractor, Owner will consider written requests for substitutions ONLY if one or more of these conditions exist:

a) Unavailability of specified products through no fault of Contractor.
b) Qualified installer is not available for specified product.
c) Substitution is required for compliance with final interpretation of code requirements or insurance regulations.
d) Subsequent information discloses inability of specified products to perform properly or to fit in designated space.
e) Refusal of manufacturer to certify or guarantee performance of the specified product as required.

2. Submit separate request for each substitution with Form 01 6320 – Contractor Substitution Request Form. Copy of form follows this Section. Provide data documenting need for substitution and substantiating compliance of proposed product with Contract Documents. Include proposed changes to contract amount and time if substitution is accepted.

3. Architect will determine acceptability of proposed substitutions and notify Contractor in writing. Accepted substitutions will be included by Change Order with associated modifications of contract amount and time.

4. Substitutions will not be considered after contract award if indicated or implied on shop drawings and product data submittals.

C. Use of approved substitution listed in Addenda or request for substitution after Contract award shall constitute representation that Contractor:

1. Has investigated product and determined it meets or exceeds quality level of specified product.
2. Will provide same warranty for substitution as for specified product.
3. Will coordinate installation and make changes to other work required to accommodate accepted substitution and complete Work.
4. Waives claims for additional costs or time extensions related to substitutions which later become apparent.

D. Procedure: Submit 3 copies of request for substitution. Limit each request to one proposed substitution. Include in request:

1. Complete data substantiating compliance of proposed substitution with Contract Documents.

2. For products:

a. Product identification, including manufacturer's name and address.
b. Manufacturer's literature containing product description, performance and test data, and reference standards.
c. Samples as required.

3. For construction methods:

a. Detailed description of proposed method.
b. Drawings illustrating methods.

4. Itemized comparison of proposed substitution with product specified.
5. Data relating to changes in construction schedule.
6. For requests submitted after Contract award, give cost data comparing proposed substitution with specified product and amount of proposed change to Contract Sum.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

PRIOR APPROVAL SUBSTITUTION REQUEST FORM

The undersigned, qualified bidder, subcontractor, manufacturer, or supplier requests that the following product be accepted for use in the Project

PRODUCT: _____

MODEL NO.: _____

MANUFACTURER: _____

ADDRESS: _____

The above product would be used in lieu of

PRODUCT: _____

specified in

SECTION: _____

PARAGRAPH: _____

Attached are the following circled items:

1. Product description including specifications, performance and test data, and applicable reference standards.
2. Drawings.
3. Photographs.
4. Samples.
5. Tabulated comparison with specified product.
6. For items requiring color selections, full range of manufacturer's color samples.
7. Other: _____

The undersigned certifies that the following statements are correct. Explanations for all items which are **not** true are attached.

1.	Proposed substitution has been thoroughly investigated and function, appearance, and quality meet or exceed that of specified product.	TRUE	FALSE
2	Same warranty will be provided for substitution as for specified product.	TRUE	FALSE
3.	**No** aspect of Project will require re-design.	TRUE	FALSE
4.	Use of substitution will **not** adversely affect:		
	a. Dimensions shown on Drawings.	TRUE	FALSE
	b. Construction schedule and date of completion.	TRUE	FALSE
	c. Work of other trades.	TRUE	FALSE
5.	Maintenance service and replacement parts for proposed substitution will be readily available in [Las Cruces] [El Paso] [Roswell] [Albuquerque] [Southern New Mexico] [Northern New Mexico] [_____] area.	TRUE	FALSE
6.	Proposed substitution does **not** contain asbestos in any form.	TRUE	FALSE

Submitted By:

COMPANY:_____

ADDRESS: _____

TELEPHONE NUMBER: _____

NAME OF PERSON SUBMITTING REQUEST: _____

TITLE: _____

DATE: _____

CONTRACTOR SUBSTITUTION REQUEST FORM

The undersigned, as Contractor for the above Project, requests that the following product be accepted for use in the Project

PRODUCT: _____

MODEL NO.: _____

MANUFACTURER: _____

ADDRESS: _____

The above product would be used in lieu of

PRODUCT: _____

specified in

SECTION: _____

PARAGRAPH: _____

Reason for substitution request: _____

Attached are the following circled items:

1. Product description including specifications, performance and test data, and applicable reference standards.
2. Drawings.
3. Photographs.
4. Samples.
5. Tabulated comparison with specified product.
6. For items requiring color selections, full range of manufacturer's color samples.
7. Documentation of reason for request.
8. Cost data for comparing proposed substitution with specified product.

The undersigned certifies that the following statements are correct. Explanations for all items which are **not** true are attached.

1. Proposed substitution has been thoroughly investigated and function, appearance, and quality meet or exceed that of specified product. TRUE FALSE

2. Same warranty will be provided for substitution as for specified product. TRUE FALSE

3. **No** aspect of Project will require re-design. TRUE FALSE

4. Use of substitution will **not** adversely affect:

   a. Dimensions shown on Drawings. TRUE FALSE

   b. Construction schedule and date of completion. TRUE FALSE

   c. Work of other trades. TRUE FALSE

5. Maintenance service and replacement parts for proposed substitution will be readily available in [Las Cruces] [El Paso] [Roswell] [Albuquerque] [Southern New Mexico] [Northern New Mexico] [_____] area. TRUE FALSE

6. Proposed substitution does **not** contain asbestos in any form. TRUE FALSE

7. All changes to Contract Sum related to use of proposed substitition are included in price listed below. Contractor waives clames for additional costs related to acceptance of substitution which may subsequently become apparent. TRUE FALSE

8. Costs of modifying project design caused by use of proposed substitution which subsequently become apparent will be paid for by Contractor. TRUE FALSE

If substitution request is accepted:

Contract Sum will be [decreased] [increased] by $ _____

Contract Time will be [decreased] [increased] by _____ calendar days.

Submitted By:

CONTRACTOR: _____

ADDRESS: _____

TELEPHONE NUMBER: _____

NAME OF PERSON SUBMITTING REQUEST: _____

TITLE: _____

DATE: _____

SECTION 01 7000

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes:

1. Basic requirements for examination, preparation and installation.
2. Requirements and limitations for cutting and patching incidental to work, including excavation and backfilling, and as required to make several parts fit together.
3. Progress cleaning.

1.2. SUBMITTALS

A. Cutting request:

1. Submit advance written request to Architect prior to cutting or other alteration which affects;

   a) Structural integrity of an element.
   b) Integrity of weather-exposed or moisture-resistant element.
   c) Operation, efficiency, maintenance, or safety of an element.
   d) Visual qualities of exposed elements.
   e) Work of others under separate contract to Owner.

2. Include in request:

   a) Project and Contractor identification.
   b) Location and description of proposed work.
   c) Necessity for cutting or alteration and alternatives to cutting and patching.
   d) Effect on work of this Contract, existing construction, and work of others under separate contract to Owner.
   e) Date work will be executed.

1.3. LOCATION OF UNDERGROUND UTILITIES

A. The Contractor shall arrange for all spotting of lines by New Mexico One Call in advance of any excavation work.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Patching and replacement materials: Those used for original installation.

B. Product substitutions: For any proposed change in patching materials, submit request for substitution in accordance with Section 01 6300 – Product Substitution Procedures.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Prior to commencing a portion of Work:

1. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work.
2. Verify that existing substrate is capable of structural attachment of new Work being applied or attached and that required blocking is in place.
3. Verify that existing substrate is compatible with, properly prepared, and otherwise ready to receive subsequent applications and finishes. Ensure that existing conditions conform to requirements of manufacturers of products to be applied.
4. Verify that utility services are available, of correct characteristics, and in correct location.

B. Prior to commencing removals and cutting and patching, inspect existing building systems and elements subject to damage or movement during subsequent operations. Document and report existing damage and operational condition of existing systems such as telecommunications, data, security, HVAC controls and fire alarm in the location of the anticipated work and in related or adjacent spaces. Such documentation shall provide the basis for conditions to be maintained or re- established by the Contractor at the end of the work.

C. Beginning of removals, cutting, patching, and new Work implies acceptance of existing conditions.

3.2. PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks and openings in substrate prior to applying next material or substance.

C. Apply manufacturer required substrate primer, sealer, and conditioner prior to applying new material or substance to substrate.

3.3. INSTALLATION

A. Install, construct, erect, assemble, and apply products in accordance with manufacturer's recommendations and instructions and specified requirements. Notify Architect where manufacturer's instructions conflict with specifications. Do not proceed until clarification is received.

B. Install products secure, rigid, plumb, and level within specified or industry acceptable tolerances.

C. Remove excess materials such as adhesive, grout, mortar, and sealants, from finished surfaces in a manner which does not stain, corrode, disfigure, or otherwise damage finished surface.

D. Adjust working parts for smooth, proper operation.

E. Replace deformed, scratched, cracked, broken, or otherwise damaged products as result of installation.

F. After installation is complete, protect installed products and finished surfaces from subsequent construction operations in accordance with Section 01 5000 – Temporary Facilities and Controls. Replace or repair subsequently damaged products and surfaces.

G. Clean and maintain installed products in accordance with manufacturer's recommendations and specifications until Substantial Completion.

3.4. CUTTING AND PATCHING

A. Execute cutting, fitting, patching, excavation. And fill as required to:

1. Install new work into existing construction.
2. Fit products together and to integrate them with other work.
3. Uncover work to correct incomplete or deficient work.
4. Remove and replace defective and non-conforming work.
5. Remove samples of installed work for testing.
6. Provide openings for penetrations of mechanical, electrical, and other work.

B. Provide temporary supports to ensure structural integrity. Provide devices and methods to protect other portions of Project from damage.

C. Provide protection from elements for areas which may be exposed by cutting operations.

D. Method: Execute work by methods to avoid damage to existing building systems and other work and in a manner which will provide appropriate surfaces to receive patching and finishing.

E. Cutting:

1. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior approval.
2. Size openings to exactly fit penetrating item plus allowance for sealant. Form edges of hold even and smooth.
3. Drill penetrations through concrete for conduit and piping
4. Drill round holes and saw cut rectangular openings in concrete unit masonry units. Where block is broken or chipped in process, remove complete face of exposed block and replace with partial block.

F. Patching:

1. Restore work with new products meetings requirements of Contract Documents.
2. Fit work tight to pipes, sleeves, ducts, conduits, and other elements penetrating surfaces.
3. At penetrations of fire rated walls, partitions, ceilings, and floors, completely seal voids with fire-resistant material, in accordance with Section 07 9000 – Joint Sealers, to full thickness of penetrated element.

G. Finishing: Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

H. Repair: Contractor shall be responsible for repair and/or restoration of existing telecommunications, data, security, HVAC controls, and fire alarm systems back to condition documented as existing prior to the commencement of work. Life safety systems and other systems impacting the operations of the school shall be restored immediately and as approved by Architect and Owner.

3.5. ASPHALT PAVEMENT

A. Where existing or new pavement is damaged from construction operations, cut to install new underground utilities and where existing items are removed from paved areas:

1. Cut pavement with saw or other means to provide neat, straight joints.
2. Where existing pavement is damaged by removals, remove additional pavement to allow clean cuts.
3. Backfill and sufficiently compact removal area prior to placement of pavement.
4. Place pavement to match existing materials and thickness.

B. Immediately after placement, protect new pavement from mechanical damage.

3.6. ROOF PENETRATIONS

A. New roofing:

1. Coordinate, locate and schedule roof penetrations prior to installation of new roof system.
2. Coordinate roof penetrations such that installation does not void roof warranty.

B. Existing roofing: Prior to penetrating, cutting, and patching existing roofing, verify with Owner if roof is under warranty. If warranted, employ roof contractor certified by manufacturer of roof system, make required inspections and notifications, and perform cutting and patching as required to ensure warranty is not violated. Protect building interior during operations and return roof to weathertight condition after the work is performed.

3.7. PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove waste materials, debris, and rubbish from site weekly and legally dispose of off-site.

C. Remove debris and rubbish from pipe chases, plenums, crawl spaces, above suspended ceilings, and other closed and remote spaces prior to enclosing space.

D. Prior to surface finishing, broom and vacuum clean interior areas to eliminate dust.

E. Washing of concrete trucks and dumping of excess cementitious material on site is not allowed. All such materials and contaminated soil shall be removed.

F. Soils and other site material contaminated by paint residues, oils, fuels, and other construction products shall be removed and replaced with equivalent soil or material.

G. Existing lawns, landscaped areas, and areas for future landscaping affected by construction operations shall be raked to remove stones, mortars, aggregates, and other construction debris in excess of 3/4 inch diameter.

H. Clean mud and sediment resulting from Contractor’s operations or traffic from all sidewalks, public streets and parking areas.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1. SUMMARY

A. This Section includes administrative and procedural requirements for the following:

B. The Owner has established that this Project shall minimize the creation of construction and demolition waste on the job site.

1. Factors that contribute to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination, shall be minimized.
2. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled.
3. Waste disposal in landfills shall be minimized.

C. LEED™ Certification: Contractor shall ensure that the work provided under this section will provide construction waste management to achieve Materials & Resources prerequisite “Construction and Demolition Waste Management Planning,” and Materials and Resources credit “Construction and Demolition Waste Management” and Innovation credit “Innovation”.

1. Materials & Resources prerequisite “Construction and Demolition Waste Management Planning”:

   a. Develop and implement a construction and demolition waste management plan as follows.

      1) Establish waste diversion goals for the project by identifying at least five materials streams (both structural and nonstructural) targeted for diversion. Approximate a percentage of the overall project waste that these materials represent.

      2) Specify whether materials will be separated or commingled and describe thediversion strategies planned for the project. Describe where the material will be taken and how the recycling facility will process the material.

   b. Provide a final report detailing all major waste streams generated, including disposal and diversion rates.
   c. Alternative daily cover (ADC) does not qualify as material diverted from disposal. Include materials destined for ADC in the calculations as waste. Land-clearing debris is not considered construction, demolition, or renovation waste that can contribute to waste diversion.

2. Materials and Resources credit MRc5 “Construction and Demolition Waste Management” (2 points required):

a. Recycle and/or salvage nonhazardous construction and demolition materials.
b. Calculations can be by weight or volume but must be consistent throughout.
c. Exclude excavated soil and land-clearing debris from calculations. Include materials destined for alternative daily cover (ADC) in the calculations as waste (not diversion). Include wood waste converted to fuel (biofuel) in the calculations; other types of waste-to-energy are not considered diversion for this credit. Adjust list below to suit Project.
d. Option 1 Path 2 .Diversion 2 Points

1) Divert 75% and four material streams (2 Points) of the total construction and demolition material.

3. Innovation – Exemplary Performance: Achieve Option 1 Path 2 and divert 95% of the total construction and demolition material.
4. Excavated soil and land-clearing debris does not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 01 5000 – Temporary Facilities and Controls for environmental-protection measures during construction and location of waste containers at Project site.

C. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council. Refer to Section 01 8113 – Sustainable Design Requirements, for certification level and certification requirements.

1.3. DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4. PERFORMANCE GOALS REQUIREMENTS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of at a minimum 75 percent by weight and or volume of total waste generated by the Work, 95% preferred.

B. Salvage/Recycle Goals Requirements: Owner's goal is to salvage and recycle as much nonhazardous construction waste as possible including the following materials:

1. Construction Waste:

a. Masonry and CMU.
b. Lumber.
c. Wood sheet materials.
d. Wood trim.
e. Metals.
f. Roofing.
g. Insulation.
h. Carpet.
i. Gypsum board.
j. Piping.
k. Electrical conduit.
l. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

C. Submit documentation for at least four separate waste streams to USGBC and respond to questions and requests from USGBC regarding construction waste, that depend on Contractor's procedures until the USGBC has made its determination on the Project's LEED certification application.

1.5. SUBMITTALS

A. Waste Management Plan: Submit within 30 days of date established for the Notice to Proceed. Plan shall comply with the requirements of LEED v4 BD+C: Schools, Materials and Resources Pre-requisite “Construction and Demolition Waste Management Planning” and Credit “Construction and Demolition Waste Management”

1. List of federal, state, and local laws, regulations, and permits concerning hazardous materials, construction and demolition waste, chemical waste, and sanitary waste that are applicable to the Contractor’s proposed operations.
2. Estimate of total project waste to be generated, name of the landfill(s) where Project waste would normally be disposed of, tipping fees, and estimated cost of disposing of project waste in landfill(s).

3. Estimate total tons or cubic yardage of the following waste category to be diverted from landfill.

    a. Concrete
    b. CMU
    c. Other

4. Estimate of total tons or cubic yards of the following waste categories to be diverted from landfill.

    a. Clean dimensional wood, palette wood
    b. Plywood, OSB, and particleboard
    c. Cardboard, paper, packaging
    d. Gypsum board (used on site as compost)
    e. Other

5. Estimate of amounts (weight, feet, square yards, gallons, etc.) of the following waste categories

    a. Metals
    b. Paint
    c. Other

B. Submittal with Application for Progress Payments: The Contractor shall submit a completed LEED-NC v4 form and supporting documentation for Materials & Resources prerequisite "Construction and Demolition Waste Management Planning," Materials and Resources credit "Construction and Demolition Waste Management" and Innovation credit "Innovation" to the Architect to be included with the comprehensive "Construction Submittal." The following project data and calculation information is required to document credit compliance using LEED-NC v4 credit templates:

1. Complete the construction waste calculation tables in the submittal template. The following info will be required to complete these tables: general description of each type/category of waste generated; location of receiving agent (recycler/landfill) for water; quantity of waste diverted (by category) in tons, or cubic yards.

2. Provide a narrative describing the project's construction waste management approach. The narrative shall include the project's Construction Waste Management Plan. Provide additional comments or notes to describe special circumstances or considerations regarding the project's credit approach.

D. Waste Reduction Progress Reports: Concurrent with each Application for Payment.

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

E. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. Qualification Data: For Waste Management Coordinator.

1.6. QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 – Project Management and Coordination. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade. See Evaluations for example of cost/revenue analysis in paragraph below. If retaining paragraph below, insert sample forms at end of Section. See Evaluations or use forms required by Owner.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1. PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Section 01 5000 – Temporary Facilities and Controls for operation, termination, and removal requirements.
2. Comply with LEED v4 BD+C: Schools requirements for at least four (4) different waste streams leaving the site. Provide documentation to USGBC for each waste stream.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

E. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

F. Comply with Section 01 5000 – Temporary Facilities and Controls for controlling dust and dirt, environmental protection, and noise control.

G. Allowing Contractor to accrue some portion of the recycling incentives in paragraph below could result in better recovery rates than if Owner accrues all of the incentives.

H. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

I. Procedures in paragraph and subparagraphs below describe the "source separated" method for handling recyclable waste. If space at Project site is limited, consider revising below to allow "co-mingled" method, which takes less space because it permits all recyclable waste to be placed in a single container that is separated later at the recycling facility.

J. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.2. RECYLCING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Gypsum Board: Stack large clean pieces on wood pallets, cover from the elements and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
2. Recycled gypsum board is not permitted in the Work.

3.3. DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 7500

STARTING AND ADJUSTING

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes: General procedures for starting, monitoring, and adjusting items of equipment and complete systems.

PART 2- PRODUCTS

Not used.

PART 3 - EXECUTION

3.1. SCHEDULING

A. Coordinate schedule for starting of systems and equipment to ensure proper sequencing.

B. Notify Architect 7 days prior to start up of each system.

3.2. PREPARATION

A. Prior to start up, inspect items of equipment and systems to ensure that:

1. Installation is in accordance with manufacturer's instructions.
2. No defective items have been installed and there are no loose connections.
3. Power supplies are correct voltage, phasing, and frequency.
4. Grounding and transient protection systems are properly installed.
5. Items have been properly lubricated, belts tensioned, and control sequence and other conditions which may cause damage have been addressed.

B. Verify that system wiring has been tested.

C. Verify that provisions have been made for safety of personnel.

3.3. STARTING OF SYSTEMS

A. Execute starting under supervision of responsible personnel in accordance with manufacturer's instructions.

B. When specified in individual sections, require manufacturer to provide authorized

representative to be present at site to inspect, check, and approve equipment and system installation prior to start up and to supervise placing equipment and system in operation.

C. Adjustment: Monitor systems and verify performance. Correct deficiencies. Replace defective components and equipment. Adjust equipment and systems for smooth and proper installation.

D. Submit written report in accordance with Section 01 3300 – Submittal Procedures that equipment and systems have been properly installed and are functioning correctly.

END OF SECTION

SECTION 01 7700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes:

1. Closeout procedures.
2. HVAC equipment inventory.
3. Final cleaning.
4. Final inspection.
5. Inspection held immediately prior to end of one year correction period.

1.2. SUBSTANTIAL COMPLETION PROCEDURES

A. Prior to or in conjunction with submission of Contractor's request for Substantial Completion, submit the following items specified in Section 01 7800 – Closeout Procedures:

1. Project record documents.
2. Operation and maintenance data and manuals.
3. Warranties.
4. Certificates of inspection and Certificate of Occupancy.
5. Insurance certificates.
6. Extra materials.
7. Keys.

B. Comply with Document 00 7000 – Execution Requirements for issuance of Certificate of Substantial Completion. When Work is sufficiently complete:

1. Inspect Work and prepare comprehensive list of items to be completed or corrected.
2. Perform final cleaning of portions of Work for which approval of substantial completion is being requested.
3. Submit 3 copies of comprehensive list of items (Contractor's Punch List) to be completed and Final Completion Schedule to Design Professional. Indicate portions of Work suitable for Owner occupancy and for which approval of substantial completion is being requested.
4. Submit Application for Payment in accordance with Section 01 2000 – Price and Payment Procedures.

C. After inspection by Design Professional and issuance of Certificate of Substantial Completion, Owner will occupy [all] of [Project] [building] for [installation of

equipment and furnishings] [to conduct normal operations] under provisions stated in Certificate of Substantial Completion.

1.3. FINAL COMPLETION PROCEDURES

A. Perform final cleaning as specified in Paragraph 1.4.

B. Prior to or in conjunction with submission of Notice of Final Completion, submit the following items:

1. Contractor's Affidavit of Payment of Debts and Claims, AIA G706.
2. Consent of Surety Company to Final Payment, AIA G707.
3. Insurance certificates.
4. Final Application for Payment as specified in Section 01200 – Price and Payment Procedures. Identify total adjusted Contract Sum, previous payments, and sum due.
5. Additional items required in Article 9.11.2 – General Conditions of the Contract.

C. Submit Notice of Final Completion certifying that Contract Documents have been reviewed, work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Design Professional's inspection.

D. Remove temporary utilities, controls, and facilities in accordance with Section 01 5000 – Temporary Facilities and Controls.

E. Request Close-Out Meeting and final inspection with Design Professional and Owner.

F. HVAC Equipment Inventory: Provide a list of major HVAC equipment and where each major piece of equipment is located, in order to assist NMHU M&O in a future comprehensive equipment inventory. Major equipment includes items such as air handlers, chillers, cooling towers, VAV or CV terminal units, and location of computer access to HVAC DDC controls (if provided).

1.4. FINAL CLEANING

A. Execute final cleaning prior to final inspection by methods and with materials and equipment suitable for commercial/institutional building maintenance.

B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; and vacuum carpeted and soft surfaces.

C. Sanitize equipment and fixtures.

D. Clean or replace filters of operating equipment.

E. Clear debris from roof, gutters and drainage systems, ceiling spaces, plenums, storage areas, and interior spaces.

F. Clean site, sweep paved areas, and rake landscaped areas and other ground surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site. Dispose of legally.

1.5. FINAL INSPECTION

A. Design Professional and Owner's representative will make inspection within 10 days of receipt of written request for Close-Out Meeting.

B. If Work is incomplete or defective:

1. Design Professional will provide Contractor written list of deficiencies.
2. Contractor shall immediately correct deficiencies and submit certification that Work is complete.
3. Design Professional and Owner's representative will re-inspect Work.
4. Re-inspection fees:

    a. When status of completion requires re-inspection by Design Professional due to failure of Work to comply as certified by Contractor, Owner will deduct amount of Design Professional's compensation for re-inspection from final payment.
    b. Re-inspection services will be billed at current rates for Design Professional's personnel.

1.6. CORRECTION PERIOD INSPECTION

A. 30 days prior to end of one year correction period, schedule and attend a one year correction period inspection. Appropriate subcontractors shall attend.

B. Coordinate time of inspection with Design Professional.

C. Representatives of Owner, Design Professional, and appropriate consultants will attend.

D. Correct deficiencies noted.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 7800

CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes procedures for preparing and submitting closeout submittals:

1. Project Record Documents.
2. Operation and maintenance manuals and data.
3. Warranties.
4. Insurance information.
5. Certificates of inspection and compliance.
6. Maintenance tools.
7. Extra materials.
8. Keys

1.2. PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to work:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed submittals.

B. Store Record Documents separate from documents used for construction. Label "Project Record Documents."

C. Record information concurrent with construction progress. Use erasable colored pencil. Date all entries. Call attention to entry by circling area affected.

D. Specifications: Legibly mark and record in each section description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

B. Contract Drawings and show drawings: Legibly mark each item to record actual construction including:

1. Actual items of equipment and system components installed.
2. Actual locations of components and routing of piping and raceways.
3. Measured horizontal and vertical locations of underground water, sewer, irrigation, electrical, and other utilities and appurtenances, referenced to permanent surface improvements.
4. Measured locations of piping, raceways, and other items concealed in construction, referenced to visible and accessible features.
5. Field changes of dimension and detail.
6. Details not on original Contract Drawings.

B. Documents will be reviewed by Architect at each submittal of Application for Payment to ensure that entries are current.

C. Submit documents to Architect prior to or in conjunction with submission of Contractor's request for Substantial Completion and in accordance with Owner's procedures.

1.3. OPERATION AND MAINTENANCE DATA

A. Provide operation and maintenance data for:

1. Mechanical equipment, systems, and controls specified in Division 15 – Mechanical.
2. Electrical equipment, systems, and controls specified in Division 16 – Electrical.
3. Other equipment and systems for which operation and maintenance data is requiested in individual specification sections.

B. Submission

1. Submit data to Architect in one or more binders.
2. Submit for review one draft copy 30 days prior to need date or as otherwise specified. This copy will be returned after review with Architect's comments. Revise content as required.
3. Once approved, submit 3 copies of final operation and maintenance manuals to Owner. All manuals shall be submitted prior to or in conjunction with Contractor’s request for Substantial Completion and prior to demonstration and training session.

C. Contents:

1. Appropriate design criteria.
2. Equipment and parts lists.
3. Operating instructions.
4. Maintenance instruction for equipment and finishes.
5. Shop drawings and product data.
6. Testing, balancing, and other field quality reports.
7. Copies of warranties. Deliver original Roofing Warranties separately to Owner, with copies in the Operations and Maintenance Manuals.

8. Directory listings.
9. Other material and information as indicated in individual specification sections and as necessary for operation and maintenance by Owner's personnel.

D. Form:

1. Hard copies of manuals shall be 8-1/2 x 11 inch text pages bound in three ring expansion binders with a hard durable plastic cover. All documents to be originals unless otherwise noted.
2. Prepare binder covers with printed subject title of manual, title of project, date, and volume number when multiple binders are required. Printing shall be on face and spine.
3. Internally subdivide the binder contents with divider sheets with typed tab titles under reinforced plastic tabs. Place dividers at beginning of each chapter, part, section, and appendix.
4. Provide a table of contents for each volume.
5. Provide directory listing as appropriate with names addresses, and telephone numbers of Architect, Contractor, subcontractors, equipment suppliers, and nearest service representatives. Provide emergency 24-hour service contact information for all subcontractors, service contractors and principal vendors.

1.4. WARRANTIES

A. Provide duplicate notarized copies of special and extended warranties as required by individual specifications sections.

B. Submit warranties to Architect prior to or in conjunction with submission of Notice of Substantial Completion.

C. Execute and assemble warranties from subcontractors, suppliers, and manufacturers.

D. Provide Table of Contents and assemble in three ring binder with a hard durable plastic cover. Internally subdivide the binder contents with permanent page dividers, with tab titling clearly typed under reinforced laminated plastic tabs.

E. For items of work delayed beyond date of Substantial Completion, provide updated warranty submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.5. CERTIFICATES OF INSPECTION AND COMPLIANCE

A. For inspections throughout the construction period required by regulatory agencies, obtain and maintain certificates issued to show compliance.

B. Assemble certificates and any formal written evidence of regulatory compliance in three ring binder with table of contents and submit to Architect prior to or in conjunction with submission of Notice of Substantial Completion.

C. Certificate of Occupancy: Prior to Substantial Completion, obtain from authorities having jurisdiction Certificate of Occupancy. Submit with Notice for Substantial Completion.

1.6. INSURANCE INFORMATION

A. Submit prior to or in conjunction with submission of Contractor's request for Substantial Completion information regarding insurance including change over requirements and insurance extensions.

1.7. MAINTENANCE TOOLS

A. Provide all special tools, instruments, and other implements required for the functional operation and maintenance of equipment, systems, and other components installed as part of this project. Include screw drivers, crescent wrenches, pliers, and allen wrenches as well as more unique and atypical tools.

B. Tools shall be as provided or recommended by manufacturers of installed equipment and systems. Types and sizes shall be as specifically required for installed products.

C. Tools shall be available and their use demonstrated during training sessions specified in Section 01 7500 – Starting and Adjusting.

D. Prior to or concurrent with Contractor's request for Substantial Completion, deliver maintenance tools to Owner's representative. Prepare inventory of tools provided and obtain receipt from Owner's representative.

1.8. EXTRA MATERIALS

A. Provide spare parts and maintenance materials in quantities specified in individual sections.

B. Extra materials shall be produced by the same manufacturer of and compatible with the installed products.

C. Prior to or concurrent with submission of Notice of Substantial Completion deliver extra materials in unopened containers to Owner's representative at designated storage area at project site and place in location as directed. Obtain receipt from Owner's representative.

D. During one year correction period:

1. Extra materials may be used by Contractor to replace expendable and normally worn parts.
2. Extra materials used by Contractor for replacement of defective products shall be replaced at no additional cost to Owner.

1.9. KEYS

A. Prior to or in conjunction with submission of Contractor's request for Substantial Completion, provide Owner with all keys for:

1. Door hardware locks after rekeying in accordance with Section 08 7100 – Door Hardware.
2. Access doors and panels.
3. Electrical panelboards and other equipment.

B. Provide a minimum of three keys for each lock.

C. Clearly label each key as to function and location of lock.

D. Obtain receipt from Owner's representative.

E. Prior to, or in conjunction with Final Completion, return all keys lent out by Owner to Contractor for access to existing spaces, gates, etc. for the Work. Obtain receipt from Owner.

1.10. MISCELLANEOUS SECURITY-RELATED MATERIALS AND COMPONENTS

A. Prior to or in conjunction with Final Completion and in accordance with General Conditions of the Contract, deliver to Owner and obtain receipt for:

1. All miscellaneous security-related items loaned to Contractor during the progress of the job, including:

a. Owner-furnished security badges and passes
b. Owner-furnished construction signs

2. All security software and codes, if any.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 7878

ENERGY CONSERVATION CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes procedures for preparing and submitting closeout submittals:

1. PNM Business Energy Efficiency Program.

1.2. PNM BUSINESS ENERGY EFFICIENCY PROGRAM

A. A Pre-Notification Application will be submitted by NMHU Facilities during the Design Development phase of the project, to register the project and reserve the potential rebate funds.

B. The General Contractor will be a Third Party signatory to the PNM Energy Efficiency Program Application. The final rebate provided by PNM and received by the General Contractor shall be reimbursed in full to NMHU by means of an MCR to the construction contract.

C. The General Contractor shall prepare and submit the PNM Energy Efficiency Program Application Checklist, Applicant Information and Agreement Form with Incentives Worksheets (the "Application") as appropriate for the project.

1. Download and complete the "New Construction Prescriptive Application"; do not download the "Whole Building Application".
2. Submit a completed DRAFT of the Application to Design Professional and NMHU Facilities for review.
3. Submit the final Application, within six (6) months of Substantial Completion, to PNM with electronic copy uploaded to e-Builder®.

D. Application Information:

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1. Check "Final" Application.
2. Name as it appears on the Utility Bill: *obtain from NMHU Facilities.*
3. PNM Account Number: *obtain from NMHU Facilities*.
4. Select Building Type.
5. Name of Company: New Mexico Highlands University.
6. Name of Contact Person: Sylvia Baca Title: Facilities Director.
7. Phone#: (505) 426-2048; Fax#: (505) 246-9020; Email: *sbaca@nmhu.edu*.

8. Installation Address, City, State, Zip:
9. Mailing Address: NMHU Facilities Department, Box 9000
   Las Vegas, NM 87701
10. Taxpayer ID: *obtain from NMHU Facilities*.
    TaxStatus:
11. Contractor Information: insert all requested information.
12. Third Party Payment Release: check the box to request that the incentive check be sent to the third party. Complete the third party information same as for General Contractor.
13. Total Incentive Requested: automatically filled in by Incentive attachments.
14. Total Project Cost: *obtain from NMHU Facilities*.
15. Project Completion Date: insert Date of Substantial Completion.

E. Agreement Form:

1. Customer Signature: to be completed by NMHU Facilities Director.
2. Third Party Signature: complete this signature before submitting to NMHU Facilities Director for signature.
3. When complete Application has been reviewed and executed by NMHU, submit to PNM via electronic and/or hard copy submittal.

F. Incentive Worksheets: Complete Incentive Worksheet for each applicable measure:

1. Download the "New Construction Prescriptive Application" Incentive Worksheets as appropriate for the project.
2. Lighting Incentives and Lighting Specifications.
3. LED Lighting Incentives.
4. HVAC Incentives and Specifications.
5. Refrigeration Incentives and Specifications.
6. Food Service Equipment Incentives and Specifications.
7. Motors and VSD's Incentives and Specifications.
8. The applicable Incentives Worksheets will populate the Application Total Incentive Requested field on the Application Form.

G. Documents will be reviewed by Design Professional and NMHU Facilities before submission to PNM.

H. Additional Documentation:

1. Invoices: submit invoices dated no more than six (6) months prior to the rebate application form.

   a. List the installation address on the invoices.
   b. Ensure invoices show correct model number for each measure installed.
   c. Ensure invoices indicate payment by the Customer (NMHU).

2. Specification Sheets:

    a. Provide a manufacturer's specification sheet for each measure installed (for example, lamps, ballasts, controls, equipment).
    b. Ensure specification sheets include all program eligibility requirements for the measure (for example, CRI of lamps, ballast factors, IPLV for AC units).
    c. Ensure the model numbers of all installed components match those listed on the invoices.

I. Modification/Change Request and Change Order:

1. Prepare an MCR refunding the full amount of the PNM rebate to New Mexico Highlands University via the construction contract balance remaining.
2. Provide a copy of the final rebate check (sent to the General Contractor as Third Party signatory),as an attachment to the MCR.
3. The MCR must be submitted to NMHU within thirty (30) days of receipt of the PNM rebate check.
4. Five percent (5%) of the Schedule of Values Closeout Line Item (see General Conditions) will be allocated to the Energy Conservation Close out activity, and paid upon approval of the MCR and Change Order which refunds the energy conservation rebate.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 7900

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes: Training of Owner's designated personnel in operation and maintenance of equipment and systems.

1.2. SUBMITTALS

A. Provide in accordance with Section 01 3300 – Submittal Procedures:

1. List of names, resumes, and qualifications of personnel conducting training sessions.
2. Preliminary schedule listing times, dates, and outline showing organization and proposed contents of training sessions for approval by Architect and Owner.
3. Copies of training manuals and othe rmaterials to be used in training sessions for approval by Architect and Owner.
4. Provide Owner additional copy of audiovisual material on the same media used in training sessions.
5. 3 copies of training manuals for future use in training by Owner.
6. Submit report within1 week after completion of training that sessions have been satisfactorily completed. Give times, dates, list of person strained, and summary of instructions.
7. Recording of ALL training sessions in one of the following common video file format: .wmv, .mpg, .mp4 submitted on a CD as part of the closeout requirements.

1.3. QUALITY ASSURANCE

A. Personnel conducting demonstration and training sessions shall be knowledgeable of installation, operation, and maintenance of specific project equipment and systems. Where appropriate manufacturer's representatives shall conduct training.

PART 2 - PRODUCTS

2.1. TRAINING MATERIALS

A. Training manuals: Loose leaf note book format with agenda and objectives of each lesson.

1. Manuals shall describe function, operation, and maintenance of various items of equipment and be suitable for personnel with high school education.
2. Manuals shall be suitable for future training of Owner personnel by Owner staff.

3. Manuals shall useful reference for staff maintaining facility.

B. Visual aids: Provide charts, handouts, overhead projector slides, electronic presentations, and other visual aids required to make effective presentation and facilitate training.

1. Equipment needed for showing visual training aids shall be provided by Contractor.
2. Visual aids shall be suitable for use by Owner's staff to train additional personnel in the future.

PART 3 - EXECUTION

3.1. SCHEDULING

A. Schedule demonstration and training sessions after equipment and systems have been completely installed, start up completed, and adjustments made. Single demonstration and training session shall be conducted of all items prior to substantial completion. Schedule with Architect to accommodate Owner's representatives.

3.2. DEMONSTRATION AND TRAINING

A. Provide demonstration and training session to emphasize operation, use, and maintenance of installed items and systems:

1. [Automatic Door Operator].
2. Mechanical systems specified in Mechanical Divisions.
3. Electrical systems specified in Electrical Divisions.
4. Other items and systems as designated by Architect or requested by Owner.

B. Conduct at project site using actual installed equipment and systems.

C. Owner shall be responsible for designating and notifying personnel to attend and ensuring attendance at scheduled sessions.

D. Have copies of operation and maintenance manuals specified in Section 01 7800 – Closeout Submittals available. Use as training aids.

E. Owner requires the GC to record all training sessions in an acceptable electronic format (.wmv, .mpg, .mp4) to be submitted as part of the closeout documents.

F. Provide a combination of classroom and walk-through training of HVAC and Controls systems, digitally recorded in accordance with 1.2 Submittals, Paragraph A, Item 7, above.

1. Trainers shall include manufacturer’s representatives and systems installers of the components and systems installed.

2. Classroom training shall cover all systems and components in accordance with Paragraphs B–E above. In addition, classroom training shall explain the sequence of operations of each HVAC component and the interfaces with the Controls system. Also, train attendees on the use of the Operations and Maintenance Manuals.
3. Walk-through training shall review each component, operation device and controller, and as part of the training attendees will operate each operating item under supervision of the trainer.

END OF SECTION

SECTION 01 81 13

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) **Silver** certification based on USGBC's LEED v4 BD+C.

1. Specific requirements for LEED are also included in other Sections.

2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.

3. A copy of the LEED Project checklist is attached at the end of this Section for information only.

    a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on aspects of Project that are not part of the Work of the Contract.

4. Completion of LEED submittal templates, documentation and uploading to LEED On-line for all contractor assigned credits are the responsibility of the Contractor.

5. Definitions included in the "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) Reference Guide and online amendments apply to this Section.

B. Related Requirements:

1. Divisions 02 through 49 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.3 DEFINITIONS

A. Bio-Based Materials: Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall be tested using ASTM D 6866 and be legally harvested, as defined by the exporting and receiving country.

B. CDPH Standard Method v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor

Sources Using Environmental Chambers, v. 1.1–2010, for the emissions testing and requirements of products and materials.

C. Chain-of-Custody (COC): A procedure that tracks a product form the point of harvest or extraction to its end use, including all successive stage of processing, transformation, manufacturing, a distribution.

D. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.

E. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.

F. Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain.

G. Environmental Product Declaration (EPD): An independently verified report based on life-cycle assessment studies that have been conducted according to a set of common rules for each product category and peer-reviewed.

1. Product-Specific Declaration: A product with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.

2. Industry-Wide (Generic) EPD: Provide products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

3. Product-Specific Type III EPD: A product with a third-party certification, including external verification, in which the manufacturer is explicated recognized by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

H. Extended Producer Responsibility (EPR): Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life.

I. Health Product Declaration Open Standard (HPD): A standard format for reporting product content and associated health information for building products and materials.

J. Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction."

K. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other USGBC approved programs.

L. Material Cost: The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but excluding field equipment and field labor costs.

M. Materials Reuse: Reuse includes salvaged, refurbished, or reused products.

N. Multi-Attribute Optimization: Third party certified products that demonstrate impact reduction below industry average in at least three of the following six categories: global warming potential; stratospheric ozone depletion; acidification; eutrophication; tropospheric ozone creation; nonrenewable resource depletion.

O. Recycled Content: Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost.

1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.

2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.

P. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.

Q. Volatile Organic Compounds (VOC) Emissions Test: Refer to CDPH Standard Method v1.1 definition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Work of this project includes completed building and application for LEED certification. Work is not complete until Owner has accepted USGBC’s final review of LEED certification.

1. Provide documentation required by LEED and LEED review.

B. Provide materials and procedures necessary to obtain LEED prerequisites and credits required on all Contractor Assigned Credits. Other Sections may specify requirements that contribute to LEED prerequisites and credits. Refer to other sections for additional materials and procedures necessary to obtain LEED prerequisites and credits.

C. Respond to questions and requests for additional information from Architect and USGBC regarding LEED credits until the USGBC has made its determination on the project's LEED certification application.

D. LEED Online Submittals: Upload LEED documentation submittal data directly to USGBC project “LEED Online” website. Complete online forms at least monthly and as necessary to document LEED credits for submittals required in this Section.

E. LEED Conference: Schedule and conduct a conference at a time convenient to Owner and Architect within 30 days after award of contract. Advise Architect, Owner's Commissioning Authority**,** and Owner’s Project Manager of scheduled meeting dates.

1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Owner’s Project Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: LEED goals for the project, Contractor’s action plans, and discussion of targeted LEED Prerequisites and Credits.
3. Minutes: Record and distribute minutes to attendees and other entities with responsibilities for obtaining LEED Credits.

1.5 ACTION SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

1. Submit each LEED submittal simultaneously with applicable product submittal.
2. Various LEED credits require photographic documentation. Provide documentation as required.

B. LEED Documentation Submittals:

1. General, Sustainable Materials Attributes Form: Project submittals must be accompanied by a completed Sustainable Materials Attributes Form. Submittal packages must also include highlighted documentation supporting the sustainability claims made on the Sustainable Materials Attributes Form.

2. Sustainable design submittals are in addition to other submittals.

    a. If submitted item is identical to that submitted to comply with other requirements, include an additional copy with other submittal as a record copy of compliance with indicated LEED requirements instead of separate sustainable design submittal. Mark additional copy "Sustainable design submittal."

3. Provide location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.
4. EAp3, Building-Level Energy Metering: Product data for meters, sensors, and data collection system used to provide continuous metering of building energy-consumption performance.
5. MRp2/MRc5, Construction and Demolition Waste Management: Comply with submittal requirements of Section 01 74 19 "Construction Waste Management and Disposal."
6. MRc2, Building Product Disclosure and Optimization: Environmental Product Declarations complying with LEED requirements.
7. MRc3, Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 1, Raw Material Source and Extraction Reporting.

a. Corporate sustainability reports for products that comply with LEED requirements for raw material and source extraction reporting.

8. MRc3, Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices.

a. Extended Producer Responsibility: Product data and certification letter from product manufacturers, indicating participation in an extended producer responsibility program and statement of costs.
b. Bio-Based Materials: Product data and certification for bio-based materials, indicating that they comply with requirements. Include statement of costs.
c. Certified Wood: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
d. Materials Reuse: Receipts for salvaged and refurbished materials used for Project, indicating sources and costs.
e. Recycled Content: Product data and certification letter from product manufacturers, indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content. Include statement of costs.

9. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting, including but not limited to the following:

1) Manufacturer Inventory.
2) Health Product Declaration.
3) Cradle to Cradle certifications.
4) Declare product labels.
5) ANSI/BIFMA e3 Furniture Sustainability Standard.

10. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 2, Material Ingredient Optimization.

a. Documentation for products that comply with LEED requirements for material ingredient optimization, including but not limited to the following:

1) GreenScreen Benchmarks.
2) Cradle to Cradle certifications.
3) REACH optimizations.

11. EQc2, Low-Emitting Materials: Product data, indicating VOC content and emissions testing documents showing compliance with requirements for low-emitting materials, for the following materials:

a. Paints and coatings.
b. Adhesives and sealants.
c. Flooring.
d. Products containing composite wood or agrifiber products or wood glues.

e. Ceilings, walls, thermal, and acoustic insulation.
f. Exterior applied materials.

12. Construction Indoor-Air-Quality (IAQ) Management:

a. Construction IAQ management plan.
b. Product data for temporary filtration media.
c. Product data for filtration media used during occupancy.
d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.

13. Prerequisite SS 1: Contractor shall create and implement an erosion and sedimentation control plan for all construction activities associated with the project. The plan must conform to the erosion and sedimentation requirements of the 2012 EPA General Construction Permit OR local standards and codes, whichever is more stringent. The plan must describe the measures implemented to accomplish the following objectives:

a. To prevent loss of soil during construction by stormwater runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse
b. To prevent sedimentation of storm sewers or receiving streams.
c. To prevent pollution of the air with dust and particulate matter.

14. IAQ Assessment:

a. Signed statement describing the building air flush-out procedures, including temperature and relative humidity during flush-out, dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
b. Product data for filtration media used during flush-out and occupancy.
c. Report from testing and inspecting agency indicating results of IAQ testing and documentation showing compliance with IAQ testing procedures and requirement

C. LEED Action Plan Components: Provide preliminary action plans within **30** days of date established for **the Notice to Proceed** indicating how the following requirements will be met:

1. MRp2/MRc5, Waste management plan, complying with Section 01 74 19 "Construction Waste Management and Disposal."
2. EQp2/EQ3/EQ4, Indoor air quality plan.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED coordinator.

B. Project Materials Cost Data: Provide statement indicating total cost and shop labor for materials used for Project. Costs exclude site labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Wood construction materials.
2. Earthwork and exterior improvements, hard costs.

C. LEED Action Plan Components: Provide preliminary submittals within **30**days of date established for **the Notice to Proceed** indicating how the following requirements will be met:

1. MRp2/MRc5, Waste management plan, complying with Section 01 74 19 "Construction Waste Management and Disposal."

2. MR c2/MR c3/MRc4 Building Optimization and Disclosure.

3. EQp2/EQ3/EQ4, Indoor air quality plan.

D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. MRp2/MRc5, Waste reduction progress reports complying with Section 01 74 19 "Construction Waste Management and Disposal."
2. MRc2, Building product disclosure and optimization – environmental product declarations.
3. MRc3, Building product disclosure and optimization – sourcing of raw materials.

    a. General: Manufacturing locations.
    b. Option 1: Corporate sustainability reports.
    c. Option 2:

        1) Extended producer responsibility.
        2) Bio-based materials.
        3) Certified wood products.
        4) Materials reuse.
        5) Recycled content.

4. MRc4, Building product disclosure and optimization – material ingredients.
5. EQc2, Low emitting materials.

    a. Low Emitting Materials Tracking Sheet monitoring the project’s progress towards targeted LEED Indoor Environmental Quality Credits. Tracking Sheet to be presented at construction meetings.

6. EQc3, Indoor air quality, during construction, complying SMACNA IAQ Guidelines.
7. EQc4, Indoor air quality assessment, complying USGBC Guidelines.

1.7 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated. Contractor to determine a combination of credit options best suited for achieving credits required.

1. Exclusions: Special equipment, such as elevators, escalators, process equipment, and fire suppression systems, is excluded from the credit calculations. Also excluded are products purchased for temporary use on the project, like formwork for concrete.

2.2 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

A. MRc2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Option 1, v4.1. Provide at least 20 permanently installed products (sourced from at least 5 different manufacturers) which meet one of the disclosure criteria:

1. Product-Specific Declaration: Valued as one product.
2. Industry-Wide (Generic) EPD: Valued as one product.
3. Product-Specific Type III EPD: Valued as 1.5 products.

B. MRc3, Building Product Disclosure and Optimization, Sourcing of Raw Materials: v4.1, Responsible Sourcing of Raw Materials. Use products sourced from at least three different manufacturers that meet at least one of the responsible sourcing and extraction criteria below for at least 15% by cost of the total value of permanently installed building products in the project. (sourced from at least 3 different manufacturers) which meet one of the disclosure criteria:

1. Extended producer responsibility program.
2. Bio-based materials.
3. Certified Wood: Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

    a. Rough carpentry.
    b. Miscellaneous carpentry.
    c. Heavy timber construction.
    d. Wood decking.
    e. Metal-plate-connected wood trusses.
    f. Structural glued-laminated timber.
    g. Finish carpentry.
    h. Architectural woodwork.
    i. Wood paneling.
    j. Wood veneer wall covering.
    k. Wood flooring.
    l. Wood lockers.
    m. Wood cabinets.
    n. Furniture if part of the construction contract.

4. Recycled content.

    a. Exceptions: Do not include **furniture (unless part of the construction contract),**]fire protection, operational plumbing, operational mechanical, and operational electrical components, and specialty items, such as elevators and equipment, in the calculation.

C. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

1. Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

    a. Manufacturer Inventory.
    b. Health Product Declarations (HPDs).
    c. Cradle to Cradle (C2C) certifications.
    d. Declare product labels.
    e. ANSI/BIFMA e3 Furniture Sustainability Standard, If part of the construction contract.

D. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 2, Material Ingredient Optimization.

1. Use products that document their material ingredient optimization using the paths below for at least 25%, by cost, of the total value of permanently installed products in the project, which meet one of the following disclosure criteria:

    a. GreenScreen benchmarks.
    b. Cradle to Cradle certifications.
    c. REACH optimizations.

2.3 LOW-EMITTING MATERIALS

A. EQc2, Low-Emitting Materials, General Emissions Requirements: Products must demonstrate they have been tested and determined compliant in accordance with California Department of Public Health, (CDHP), Standard Method v1.1-2010, using the applicable exposure scenario. Manufacturer's documentation demonstrating compliance must state the range of total VOCs (tVOC) after 14 days measured as specified in the CDPH Standard Method v1.1 as follows:

1. 0.5mg/m3 or less,
2. between 0.5 and 5.0 mg/m3 or,
3. 0.50 mg/m3 or more.

B. EQc2, Low-Emitting Materials, Paints and Coatings: For field applications, inside the weatherproofing system, use paints and coatings that comply with the limits for VOC content when calculated according to the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.

Product Type:	Allowable VOC Content (g/L):
Bond Breaker	350
Clear wood finishes - Varnish	275
Clear wood finishes – Sanding Sealer	275
Clear wood finishes - Lacquer	275
Colorant – Architectural Coatings, excluding IM coatings	50
Colorant – Solvent Based IM	600
Colorant - Waterborne IM	50
Concrete – Curing compounds	100
Concrete – Curing compounds for roadways & bridges	350
Concrete surface retarder	50
Driveway Sealer	50
Dry-fog coatings	50
Faux finishing coatings - Clear topcoat	100
Faux finishing coatings – Decorative Coatings	350
Faux finishing coatings - Glazes	350
Faux finishing coatings - Japan	350
Faux finishing coatings – Trowel applied coatings	50
Fire-proof coatings	150
Flats	50
Floor coatings	50
Form release compounds	100
Graphic arts (sign) coatings	150
Industrial maintenance coatings	100
Industrial maintenance coatings – High temperature IM coatings	420
Industrial maintenance coatings – Non-sacrificial anti-graffiti coatings	100
Industrial maintenance coatings – Zinc rich IM primers	100
Magnesite cement coatings	450
Mastic coatings	100
Metallic pigmented coatings	150
Multi-color coatings	250
Non-flat coatings	50
Pre-treatment wash primers	420
Primers, sealers and undercoaters	100
Reactive penetrating sealers	350
Recycled coatings	250
Roof coatings	50
Roof coatings, aluminum	100
Roof primers, bituminous	350
Rust preventative coatings	100
Stone consolidant	450
Sacrificial anti-graffiti coatings	50
Shellac- Clear	730
Shellac – Pigmented	550
Specialty primers	100

Stains	100
Stains, interior	250
Swimming pool coatings – repair	340
Swimming pool coatings – other	340
Traffic Coatings	100
Waterproofing sealers	100
Waterproofing concrete/masonry sealers	100
Wood preservatives	350
Low solids coatings	120

C. EQc2, Low-Emitting Materials, Paints and Coatings: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. EQc2, Low-Emitting Materials, Adhesives and Sealants: For field applications, use adhesives and sealants that comply with the limits for VOC content when calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005:

Architectural Applications:	Allowable VOC Content (g/L):
Indoor carpet adhesives	50
Carpet pad adhesives	50
Outdoor carpet adhesives	150
Wood flooring adhesives	100
Rubber floor adhesives	60
Subfloor adhesives	50
Ceramic tile adhesives	65
VCT and asphalt tile adhesives	50
Dry wall and panel adhesives	50
Cove base adhesives	50
Multipurpose construction adhesives	70
Structural glazing adhesives	100
Single ply roof membrane adhesives	250
Specialty Applications:	
PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Computer diskette manufacturing	350
Contact adhesive	80
Special purpose contact adhesive	250
Tire retread	100
Adhesive primer for traffic marking tape	150
Structural wood member adhesive	140
Sheet applied rubber lining operations specialty	850

Top and Trim adhesive	250
Substrate Specific Applications:	
Metal to metal substrate specific adhesives	30
Plastic foam substrate specific adhesives	50
Porous material (except wood) substrate specific adhesives	50
Wood substrate specific adhesives	30
Fiberglass substrate specific adhesives	80
Sealants:	
Architectural sealant	250
Marine deck sealant	760
Nonmember roof sealant	300
Roadway sealant	250
Single-ply roof membrane sealant	450
Other sealant	420
Sealant Primers:	
Architectural non-porous sealant primer	250
Architectural porous sealant primer	775
Modified bituminous sealant primer	500
Marine deck sealant primer	760
Other sealant primer	750
Other	
Other adhesives, adhesive bonding primers, adhesive primers or any other primers	250

1. Exception: The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.

E. EQc2, Low-Emitting Materials, Adhesives and Sealants: For field applications that are inside the weatherproofing system, 90 percent of adhesives and sealants shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. EQc2, Low-Emitting Materials, Flooring: Flooring shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. EQc2, Low-Emitting Materials, Composite Wood: Composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

H. EQc2, Low-Emitting Materials, Ceilings, Walls, Thermal, and Acoustic Insulation: Ceilings, walls, and thermal insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

I. EQc2, Low-Emitting Materials, Furniture: Only if part of the construction contract. At least 90 percent of furniture, measured by cost, shall be tested in accordance with ANSI/BIFMA

Standard Method M7.1-2011; comply with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2, using either the concentration modeling approach or the emissions factor approach; and model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate.

J. Additional Low-Emitting Requirements:

1. If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.

2. If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.

3. Methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

2.4 INDOOR WATER USE REDUCTION

A. WEp2, Indoor Water Use Reduction, Appliances: Provide ENERGY STAR or performance equivalent appliances.

B. WEp2/WEc2, Indoor Water Use Reduction, Plumbing Fixtures: Do not exceed water flow requirements indicated in Division 22 - PLUMBING

PART 3 - EXECUTION

3.1 NONSMOKING BUILDING

A. EQp2, Environmental Tobacco Smoke Control: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. MRp2 MRc5, Construction and Demolition Waste Management: Comply with Section 01 74 19 "Construction Waste Management and Disposal."

3.3 CONSTRUCTION IAQ MANAGEMENT

A. A. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install MERV 8 filter media at each return-air inlet for the air-handling system used during construction.

2. Replace air filters immediately prior to occupancy.

3.4 IAQ ASSESSMENT

A. Flush-Out:

1. After construction ends, prior to occupancy and with all interior finishes and furniture installed, perform a building flush-out by supplying a total volume of 14,000 cu. ft. (4 300 000 L) of outdoor air per sq. ft. (sq. m) of floor area (calculated on a per room basis) while maintaining an internal temperature of at least 60 deg F (16 deg C) and a relative humidity no higher than 60 percent.

2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. (1 070 000 L) (calculated on a room-by-room basis) of outdoor air per sq. ft. (sq. m) of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. (1.52 L/s per sq. m) of outside air or the design minimum outside-air rate, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cu. ft./sq. ft. (4 300 000 L/sq. m) (calculated on a room-by-room basis) of outside air has been delivered to the space.

END OF SECTION

SECTION 01 9133

COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1. SCOPE

A. The work under this Section is subject to requirements of the Contract Documents including Owner's General Conditions. Commissioning Authority has been hired by the owner.

1.2. DESCRIPTION

A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that O&M documentation left on site is complete.
4. Verify that the Owner's operating personnel are adequately trained.

B. The commissioning process does not take away from or reduce the responsibility of the system designers, general contractor, construction manager or installing contractors to provide a finished and fully functioning product.

C. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

D. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the

documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CxA.

E. The followings systems are to be commissioned. Each specification division may contain additional commissioning requirements.

1. Mechanical HVAC System – Division 23
2. Electrical Lighting System – Division 26

F. Responsibility for performing startup, performing Functional Tests, recording results on forms provided by contractor and approved by CxA, correcting deficiencies, and retesting lies solely with Installing Contractors. CxA may witness startup, witness tests, or recommend solutions to problems, but is not required to do so. Installing Contractor shall not rely on such recommendation unless directed in writing to do so by Owner, and shall in no event make any claim against CxA for any such recommendation.

1.3. DEFINITIONS

Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

Approval - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

Architect / Engineer (A/E) - the prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included.

Commissioning authority (CxA) - an independent agent, not otherwise associated with the A/E team members or the Contractor. The CxA directs and coordinates the day-to-day commissioning activities. The CxA does not take an oversight role like the CM. The CxA is part of the Construction Manager (CM) team or shall report directly to the CM.

Commissioning Plan - an overall plan, developed before or after bidding, that provides the structure, schedule and coordination planning for the commissioning process.

Contract Documents - the documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, *Cx Plan*, etc.).

Contractor - the general contractor or authorized representative.

Control system - the central building energy management control system.

Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

Deferred Functional Tests - FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

Design Intent - a dynamic document that provides the explanation of the ideas, concepts and

criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.

Factory Testing - testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.

Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

General Contractor (GC) - the prime contractor for this project. Generally refers to all the GC's subcontractors as well. Also referred to as the Contractor, in some contexts.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Non-Compliance - see Deficiency.

Non-Conformance - see Deficiency.

Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Owner-Contracted Tests - tests paid for by the Owner outside the GC's contract and for which the CxA does not oversee. These tests will not be repeated during functional tests if properly documented.

Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.

Prefunctional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional

checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

Project Manager (PM) - the contracting and managing authority for the owner over the design and/or construction of the project, a staff position.

Sampling - functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

Seasonal Performance Tests - FT that are deferred until the system(s) will experience conditions closer to their design conditions.

Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

Specifications - the construction specifications of the Contract Documents.

Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.

Subs - the subcontractors to the GC who provide and install building components and systems.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents (Sections 15997; 16997, etc.).

Trending - monitoring using the building control system.

Vendor - supplier of equipment.

Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.4. COMMISSIONING AUTHORITY (CxA)

A. Commissioning Authority (CxA) refers to the consultant that directs and coordinates the commissioning activities. Although the title "Commissioning Agent" may appear in this or other Specification Sections to identify CxA, CxA is not an agent of Owner.

B. Nothing in Owner's agreements with the Architect, CM/GC, and other members of the Cx Team, nothing in agreements between parties other than CxA, and nothing in this Specification or the Contract Documents shall create a contractual relationship between CxA and any person or organization. Neither CxA's authority to act under the Contract Documents nor any decision made by CxA in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of CxA to any member of the CxTeam or any other person or organization per-forming any of the Work, or to any surety for any of them.

C. CxA is not responsible for the means, methods, techniques, sequences or procedures of construction, safety precautions, acts or omissions of Owner, A/E, CM/GC, Installing

Contractors, Vendors, or any other entity.

D. Although CxA is not authorized to issue or award Change Orders, CxA may at its sole option offer advice, suggestions, and opinions. CM/GC, Installing Contractors, Vendors, and other entities shall not rely on such advice, suggestions, and opinions unless directed in writing to do so by Owner, and shall, in no event, make any claim against CxA for any such advise, suggestions, and opinions.

E. Indemnification: To the fullest extent permitted by law, CM/GC shall indemnify and hold harmless CxA, and the officers, directors, partners, employees and agents of CxA, from and against any and all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused in whole or in part by the negligent acts or omissions of CM/GC, Installing Contractors, Vendors, and other entities performing any of the work.

F. Additional Insured: CM/GC shall direct its insurer to list CxA as an Additional Insured on general liability insurance policies covering this project. Contractor shall require Installing Contractors to list CxA as an Additional Insured on general liability insurance policies covering this project. Contractor shall submit certificates of insurance to CxA.

1.5. COMMISSIONING PLAN

A. The CxA will develop a project specific Commissioning Plan that provides additional detailed commissioning instructions including but not limited to: training curriculum requirements, Functional Testing tolerance standards and requirements, deferred testing requirements, commissioning documentation requirements, Pre-functional Checklists, and Functional Test Forms. Submittal data to be furnished by Installing Contractors will be a source of input information for the Cx Plan, so the Cx Plan cannot be provided until after construction begins. Nevertheless, all members of the CxTeam shall comply with the Commissioning Plan without additional compensation for doing so.

1.6. COMMISSIONING TEAM MEMBERS AND RESPONSIBILITIES

The Commissioning Team (CxTeam) consists of the following entities. The general duties of each are listed to provide an overview of commissioning work allocation, but this list is not fully descriptive of the commissioning work of each entity.

A. Owner

1. Attend commissioning kick-off meeting and subsequent commissioning meetings.
2. Provide Owner personnel for training in system and equipment operation and maintenance

B. Architect/Engineer (A/E)

1. Attend commissioning kick-off meeting and subsequent commissioning meetings.
2. Participate in training of Owner personnel.

C. Commissioning Authority (CxA)

1. Coordinate commissioning activities with CxTeam members.
2. Chair commissioning kick-off meeting and subsequent commissioning meetings.
3. Prepare Commissioning Plan.
4. Keep Owner apprised of commissioning activities on a regular basis.
5. Review and approve Pre-functional Checklists and Functional Test Forms.
6. Identify commissioning activities for inclusion into the project schedule by CM/GC.
7. Review mechanical submittals. This is not a formal review.
8. Review manufactures' startup guidelines provided by Installing Contractors and prepare startup checklists.
9. Review Training Plans developed by CM/GC and Installing Contractors.
10. Review Pre-Functional Checklists completed by Installing Contractors.
11. Witness startup of major equipment and selected minor equipment.
12. Review TAB execution plans and review completed TAB reports. Provide sample verification of final TAB report readings.
13. Witness selected Functional Tests.
14. Review, track and coordinate resolution of non-compliance and deficiencies identified by CxA Team.
15. Review O&M manuals compiled and submitted by Installing Contractors for compliance with contact document requirements.
16. Monitor completion of required Owner's O&M staff training.
17. Provide final commissioning report, summarizing final disposition of building systems after Functional Testing.

D. General Contractor (GC)

1. Review Cx Plan, Pre-Functional Checklists, and Functional Test procedures.
2. Attend commissioning kick-off meeting and subsequent commissioning meetings
3. Develop a comprehensive commissioning schedule using data provided by Installing Contractors.
4. Incorporate commissioning activities into the construction schedule.
5. Periodically update commissioning activities in the construction schedule.
6. Facilitate cooperation of Installing Contractors in commissioning work.
7. Submit copies of A/E approved submittals to CxA for review.
8. Verify equipment and systems installations are complete and startup activities are completed by Installing Contractors. Assure CxA that equipment and systems are ready for execution of Pre-Functional Checklists and Functional Testing.
9. Insure resolution of non-compliances and deficiencies identified by Cx Team. Obtain written documentation of completion from the appropriate Installing Contractors.
10. Schedule, coordinate and assist in seasonal or deferred testing.

E. Installing Contractors/Vendors

1. Review Commissioning Plan, Pre-Functional Checklists, and Functional Test procedures
2. Attend commissioning kick-off meeting and subsequent commissioning meetings
3. Notify CxA of work completion during each phase of construction (installation, piping, ducting, insulation, controls, electrical) so that CxA may review to verify work completion.
4. Provide necessary personnel to assist CxA (e.g. remove FCU covers, open electrical

panel covers, etc.).
5. Provide qualified personnel, tools and equipment. Prepare and Execute Pre-Functional Checklists and perform Functional Tests. Execute all equipment and systems testing (e.g. duct pressure testing, piping pressure testing, piping flushing, etc.) and submit completed testing documentation to CxA for inclusion in final commissioning report. Give one-week advance notice to CxA prior to equipment startup and Functional Tests.
6. Prepare and submit O&M manuals as required elsewhere in these specifications. Provide manufacture recommended startup procedures.
7. With CM/GC, develop overall schedule for equipment/systems startup and testing.
8. Provide certified and calibrated instrumentation required to take measurements of system and equipment performance during startup and testing.
9. Prepare training plans and execute training.
10. Execute seasonal or deferred Functional Testing. Make necessary amendments to O&M manuals and as-built drawings for applicable issues identified in seasonal/deferred testing.

F. Controls Contractor

1. Completely install and thoroughly inspect, startup, test, adjust, calibrate and document building automation system.
2. Provide notebook computer, software and training to accommodate TAB Contractor in system balancing.
3. Maintain database of control parameters submitted by TAB Contractor subsequent to field adjustments and measurements. Cooperate with and assist TAB Contractor.
4. Provide on-site technician skilled in software programming and hardware operation to exercise sequences of operation and to correct control deficiencies identified during Functional Testing including deferred seasonal testing.
5. Provide instrumentation, computer, and software and communication resources to demonstrate operation of building systems during Functional Testing including deferred seasonal testing.
6. Attend commissioning kick-off meeting and subsequent commissioning meetings.
7. Prepare and submit O&M manuals.
8. Prepare training plans and execute training.
9. Maintain comprehensive records of all control system startup records including but not limited to system calibration checkout records and point-to-point checklists. Submit all control system startup records to CxA prior to start of Functional Testing.
10. Set up trend logs as requested by CxA to substantiate proper systems operation.

G. Test, Adjust and Balance Contractor

1. Attend commissioning kick-off meeting and subsequent commissioning meetings.
2. Submit TAB Plan and forms describing methodology for execution of test and balance procedures specific to this project to CxA for review.
3. Cooperate with Controls Contractor.
4. Submit copy of final TAB report to CxA for review prior to start of Functional Testing.
5. Rebalance deficient areas identified during commissioning.
6. Provide on-site technician and TAB equipment to verify equipment and system performance during Functional Testing including deferred seasonal testing.

7. Provide on-site technician and equipment to provide verification of the final TAB report by CxA. Under direction of CxA, TAB Contractor shall recheck a sampling of the final air and water readings. TAB Contractor shall include a minimum of 16 man-hours for this work.
8. Prepare training plans and execute training.
9. Provide certificates of calibration for all equipment.

1.7. COORDINATION

A. Members of Cx Team must work together cooperatively to jointly produce a high quality construction project for Owner.

B. Management: CxA shall manage Cx Team. Other members of CxTeam shall cooperate with CxA to fulfill both their contracted responsibilities and the objectives of the Contract Documents. CM/GC shall integrate commissioning activities into the overall project schedule. Each CxTeam member shall address scheduling problems and make necessary notifications in a timely manner in order to ensure success in implementing the commissioning process.

C. Kick-off Meeting: Within 30 days of the commencement of construction, CxA shall chair a commissioning kick-off meeting. The responsibilities of each member of CxTeam shall be identified and assigned at this meeting. CxA shall distribute meeting minutes to all parties.

D. Commissioning Meetings: CxA shall chair commissioning meetings during the Construction Phase. These meetings shall be the forum for coordinating commissioning activities and reviewing the issues log.

E. Scheduling:

1. Prior to the kick-off meeting, CxA shall provide a preliminary list of commissioning activities to CM/GC. CM/GC shall integrate the preliminary commissioning activities into the project schedule and distribute a copy of the initial schedule at the kick-off meeting.
2. As construction progresses, CM/GC shall coordinate with Installing Contractors to define specific commissioning activities. CM/GC shall then prepare detailed schedules showing specific commissioning activities. CM/GC shall distribute updated schedules at least every other week during the construction period.
3. Since CxA will spot observe the tests, CM/GC and Installing Contractors shall accommodate CxA's time restrictions by making modifications to the commissioning schedule when so requested by CxA

1.8. SUBMITTALS

A. CxA shall review the following documents for conformance with commissioning requirements. The purpose of CxA's review is to aid in development of Functional Testing procedures. A/E is solely responsible for the technical review of submittal document.

B. Technical Documents: Installing Contractors to submit certain documents for A/E's

review and/or approval. After A/E returns those documents with A/E's comments to CM/GC, CM/GC shall deliver one copy of each of the marked-up documents related to commissioning to CxA. CxA shall retain that copy for its files. CxA may offer suggestions, questions, or comments related to submittals.

C. Startup Recommendations: CM/GC shall submit manufacturer's recommended startup procedures for all equipment described in Divisions 22, 23 and 26 to CxA within 90 days of the earlier of the date on which the construction contract is executed, Owner gives notice to proceed to CM/GC, or CM/GC begins work on the Project.

D. O &M Manuals: CM/GC shall deliver one copy of each O&M manual for equipment described in to CxA within 90 days of the earlier of the date on which the construction contract is executed, Owner gives notice to proceed to CM/GC, or CM/GC begins work on the Project. (Note: It is traditional on construction projects for contractors to submit O&M manuals at the end of the project. On this project, O&M manuals must be submitted much earlier. The providing of O&M manuals earlier than the traditional time of the project shall not be grounds for claims by CM/GC for additional money or time.) This provision shall not relieve CM/GC from its responsibility to provide additional copies of O&M manuals as may be required elsewhere in the Specifications.

1.9. PRE-FUNCTIONAL CHECKLIST

A. Prior to the date scheduled for equipment startup, CxA will provide a written PFC for each item of equipment to be commissioned.

B. Installing Contractors shall perform equipment startup and complete startup checklists. Installing Contractors shall give at least one-week notice to CxA before starting-up of each item of equipment to allow CxA to determine if it desires to witness the startup of that item of equipment. At the completion of startup of each item of equipment, Installing Contractors shall provide a fully completed and signed startup checklist to CxA. Verification by CxA of proper startup is required prior to Functional Testing.

1.10. FUNCTIONAL TESTING

A. Prior to the date scheduled for Functional Testing, CxA will provide written Functional Test Procedures for each item of equipment and each system to be commissioned

B. Installing Contractors shall perform Functional Tests.

C. Installing Contractors shall give at least one-week notice to CxA before each Functional Test to allow CxA to determine if it desires to witness the test. At the completion of each Functional Test, Installing Contractors shall provide a fully completed and signed Functional Test Form to CxA.

D. Non-Conformance:

1. CxA will record results of Functional Testing. Deficiency or non-conformance issues will be noted and reported to CM/GC and Owner.
2. Corrections of minor deficiencies identified may be made by Installing Contractors during tests at discretion of CxA. In such cases, deficiency and resolution will be documented on Functional Test Form.

3. Cx Team shall expedite testing and minimize unnecessary delays, while not compromising integrity of tests. CxA shall not overlook deficient work or loosen acceptance criteria to satisfy scheduling or cost issues unless directed to do so by Owner.

1.11. COST OF RETESTING

A. If Installing Contractor is responsible for a deficiency, Installing Contractor's costs related to re-performing a checklist or test shall be borne by Installing Contractor. If Installing Contractor is not responsible for a deficiency, any cost recovery for retesting shall be negotiated between Installing Contractor and CM/GC. In no event shall Owner, Architect, or CxA be financially responsible to CM/GC or Installing Contractor for retesting.

B. Retesting by any party for any reason shall not be considered a justified reason for a claim of delay, for a contractual time extension, or for extra compensation.

C. CxA will absorb its own costs related to a single startup and a single Functional Test of each item of equipment and each system. If a second or subsequent startup or retest is required for any reason, or if nstalling Contractor is not ready for a startup or test at the scheduled time, CM/GC shall compensate Owner for CxA's additional time and expenses. Compensation shall be computed by multiplying hours worked by CxA times CxA's hourly billing rate of $450 and adding the cost of CxA's expenses (including by way of example but not limitation: air travel, car rental, lodging, long distance, reproduction, special insurance, procured equipment, leased equipment, delivery service, and postage). CM/GC may unilaterally withhold said funds from payments otherwise due to Installing Contractor.

1.12. TRAINING OWNER PERSONNEL

A. A/E Training: Prior to training by Installing Contractors, A/E shall chair a meeting with Owner's facilities management personnel to explain mechanical and electrical design concepts. Installing Contractors, TAB Contractor, CxA and Control Contractor shall attend. The purpose of this meeting is to assure that Owner's personnel and contractors understand how systems were intended to operate. A/E-furnished flow charts, system diagrams, and sequence of operation narratives should be distributed at the meeting.

B. Installing Contractor Training: Installing Contractors shall train Owner's personnel in the proper operation and maintenance of all equipment and systems provided under Divisions I (Note that additional training may be required in Divisions or elsewhere in the specifications.)

1. Training shall occur after Functional Testing has been completed.
2. At least 30 calendar days before each training session, Installing Contractor shall submit to CxA the following information:

    a. Intended audience.
    b. Location, time, and date of training.
    c. Objective of training.
    d. Methods (classroom lecture, video, site walk-through, actual operational

demonstrations, written handouts, etc.)

e. A copy of course materials including operating requirements, preventative maintenance procedures, special tools needed, and spare parts inventory suggestions.

f. Instructor qualifications. Installing Contractors shall provide manufacturer-certified experts to perform training. Written certification of trainer's qualifications on manufacturer's letterhead must be submitted to CxA at least 30 days before training takes place. Trainers shall have practical building operating expertise as well as knowledge of all modes of operation of the specific item of equipment or system. More than one party may be required to execute the training. CxA is specifically authorized to reject trainers who, in CxA's sole opinion, are not qualified. Among the qualifications to be considered by CxA are each trainer's expert knowledge relative to the specific equipment involved, trainer-provided training documents, and each trainer's attitude/willingness to work cooperatively with CxA.

3. Details of training curriculum requirements will be contained in Cx Plan.
4. The format and training agenda shall follow those in Guidelines for Commissioning HVAC Systems, ASHRAE, 1989R, 1996. Classroom sessions may include the use of overhead projections, slides, video and audio taped material, as might be appropriate. Hands-on traininG shall include startup; operation in all modes including manual, shut-down, fire/smoke alarm, power failure, and emergency; and maintenance.
5. During any class or demonstration, should the system fail to perform in accordance with the requirements of the operation and maintenance manual or sequence of operations, the system shall be repaired or adjusted and the demonstration or class shall be repeated.
6. Installing Contractors shall distribute copies of training literature (guides, books, handouts, graphic exhibits, etc.) to each trainee at least ten calendar days before each training session so trainees have sufficient time to review the course literature in advance of each session.
7. One or more employees or representatives of CxA may attend each training session to document that training achieved the desired goal. Re-training shall be provided by Installing Contractors at no additional cost to Owner if CxA determines that the training goal was not achieved.
8. All training sessions shall be video-taped by the Installing Contractor for future use by the Owner.

PART 2 - PRODUCTS

2.1. TEST EQUIPMENT

A. Installing Contractors shall provide all specialized tools, test equipment and instruments required to execute startup, checkout and Functional Testing of equipment and systems they provide and/or install.

B. Test equipment shall be of sufficient quality and accuracy to test and/or measure components and system performance with tolerances specified. A testing laboratory shall have calibrated test equipment within the previous 12 months. Calibration shall be NIST traceable. Equipment shall be calibrated according to manufacturer's recommended

intervals and when dropped or damaged. Calibration tags shall be affixed or certificates made readily available to CxA.

PART 3 - EXECUTION

Not Used.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 02 4113

SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1. SUMMARY

A. Protection of building portions and equipment to remain.

B. Removal and storage of items to be re-used or salvaged.

C. Property protection.

D. Public protection.

1.2. SUBMITTALS

A. Comply with Section 01 1000 – Summary.

B. Fencing plan for protection of site.

C. Protection plan and details showing areas to be protected, methods of attachment and materials to be used.

D. Plan and details for sidewalk protection.

E. Indicate demolition and removal sequence and location of salvaged items.

F. Location and construction of barricades, fences, and temporary work to provide protection for public right-of-ways and private property.

G. Pre-demolition Photographs: Document existing conditions of adjoining construction and site improvements, including finish surfaces, that is likely to be misconstrued as damage caused by selective demolition operations.

H. Shoring plan for structural demolition.

1. Shop drawings for shoring are to be prepared by a structural engineer licensed in the state of the project.

1.3. PROJECT RECORD DOCUMENTS

A. Comply with Section 01 1000 – Summary.

B. Accurately record actual locations of capped utilities, subsurface obstructions, and

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

relocated other items.

1.4. REGULATORY REQUIREMENTS

A. Secure and pay for special use permits, governmental fees, licenses and disconnection charges necessary for proper execution of demolition work.

B. Conform to local/regional rules governing demolition of site structures, safety of adjacent structures, dust control, noise control, run-off control and disposal.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct roadways, sidewalks, or hydrants without permits.

E. Obtain permits required for sidewalk protection.

F. Provide controlled inspections for shoring and structural demolition. These inspections shall be performed in accordance with the requirements of the local building authorities.

1.5. SITE CONDITIONS

A. Protection of Persons: Owner activities will continue in and about Project site during construction. Install barricades as part of this Work and post with warning lights.

B. Protect adjacent areas that are to remain from dust infiltration, unless otherwise noted on the Drawings.

C. Bench Marks and Monuments: Maintain benchmarks and monuments existing on site.

D. Protection of Existing Property to Remain: Protect existing plants, equipment, and structures that are in areas where Work will be performed and which are to remain. Repair or replace existing property that is to remain that is damaged by Work of this Contract to Architect's satisfaction and at no cost to Owner.

E. If, during the course of demolition work, hazardous materials are encountered or suspected and no provision has been specified in other sections for removal or containment, promptly notify the Owner. Do not perform work related to hazardous materials prior to receiving instructions from the Owner.

F. Removal and disposal of hazardous materials is not anticipated and should not be considered a part of the Work unless otherwise specified or directed by Owner.

G. Refer to Section 01 1000 - Summary for site Work to be completed by Owner prior to the start of Work of this Contract.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 2 - PRODUCTS

2.1. PROTECTION AND SHORING MATERIALS

A. Provide materials as required for:

1. Protection fences

B. Provide materials as required for the following types of protection:

1. Protection from water infiltration due to rain or snow.
2. Protection of areas to remain from dirt, debris and dust.
3. Protection of items and structures to remain from impact damage from demolition and construction.
4. Site protection for trees and other planting areas.

C. Provide tarps as required to protect building from the weather during demolition. Keep tarps in good condition while in use. Replace as tarps are damaged with use.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas and conditions under which site preparation, clearing and demolition are to be performed. Do not proceed with Work until unsatisfactory conditions have been corrected.

B. Verify and assume full responsibility for adequacy of bearing and foundation conditions for construction equipment and operations.

3.2. PREPARATION

A. Provide, erect, and maintain temporary barriers and security devices at locations as directed by Architect.

B. Protect existing landscape materials, appurtenances, and structures that are not to be demolished.

C. Prevent movement or settlement of adjacent structures. Provide bracing or shoring.

D. Existing Utilities: Locate and mark existing utilities that are on Project site where Work is to be performed.

E. Keep adequate fire protection on site at all times.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.3. DEMOLITION REQUIREMENTS

A. Conduct site demolition to minimize interference with adjacent structures.

B. Cease operations immediately if adjacent structures are affected by demolition operation. Notify Architect, and do not resume operations until directed.

C. Repair demolition performed in excess of that required, at no cost to the Owner.

D. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations; . Return adjacent areas to condition existing prior to the start of work.

E. Leave bottom of demolition excavations clean and free of demolished materials or existing structural elements unless otherwise indicated.

F. Conduct operations with minimum interference to public or private accesses. Maintain protected egress and access.

G. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon, or limit access to their property.

H. Sprinkle Work with water to minimize dust. Provide hoses and water connections for this purpose.

I. Contractor shall salvage items to be saved prior to start of demolition. Items are to be wrapped, labeled, and stored on site as directed by the Owner.

J. Owner shall salvage items to be saved prior to start of demolition. Items will be wrapped, labeled, and stored on site by the Owner.

K. When work has started, notify Architect and Engineer immediately if unknown conditions are discovered. If such conditions are found, do not proceed with work in the affected area until notified to do so.

L. When demolition has started, contact Architect immediately if further clarification needs to be made regarding items to remain.

M. Ensure that building areas that are to remain heated or cooled are properly protected and closed off from areas to be demolished and/ or opened to the weather. Provide materials as necessary to properly seal off these spaces from the weather.

3.4. TOOLS AND EQUIPMENT

A. Use only tools and equipment that are appropriate for the specific task.

B. Do not use tools that will cause damage to structural and non structural members that are

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

to remain.

C. Do not use cutting torches to remove steel or other metal members until flammable materials are removed from the area of cutting.

D. Ensure that where topping slabs and other non structural elements are removed or channeled that work does not penetrate structural elements.

3.5. DEMOLITION

A. Demolish areas of building as noted on the Drawings. Take care not to demolish areas or equipment to remain.

B. Demolition is to include removing items noted on the demolition plan and all other items as required to be removed to accommodate the new construction.

C. Remove debris from site and dispose of legally. Provide dumpsters as required for debris and trash removal.

D. Materials that are to be removed, saved, and reused are to be removed carefully so as to not damage the material. Carefully store these materials in a safe place and protect from damage and the weather.

E. Ensure that concrete and underground utilities that are to be removed are excavated and removed from site. Do not bury debris on site.

F. When demolition is complete, leave site ready for new construction and/ or excavation.

G. Install shoring, temporary rails and other protection required as work progresses for a safe work place.

H. Disconnect, remove, and cap designated utilities within demolition areas.

I. Remove materials under this Section from Project site, except suitable fill and topsoil material complying with Section 31 2000 – Earthwork.

1. Stockpile material to be reused and protect from contamination.

3.6. CLEANING

A. Clean site of debris and unused materials, and remove from site.

B. Keep public roadways free of mud, soil, and debris to satisfaction of regulatory agencies.

C. Comply with Section 01 1000 – Summary.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 03 1100

CONCRETE FORMWORK

PART 1 - GENERAL

1.1. WORK INCLUDED

A. This section includes formwork for cast-in-place concrete, including waterstops, and installation of embedded items.

1.2. RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 2000 – Concrete Reinforcement

B. Section 03 3000 – Cast-In-Place Concrete

1.3. QUALITY ASSURANCE

A. Comply with the American Concrete Institute Standard, ACI 347R-94, Recommended Practice for Concrete Formwork.

1.4. REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1.	ASTM D 226-97a	Standard Specification for Asphalt - Saturated Organic Felt used in Roofing and Waterproofing".
2.	ASTM D 1751-83	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

PART 2 - PRODUCTS

2.1. MATERIALS

A. Forms for Exposed Finish Concrete: Plywood complying with U.S. Product Standard PS-1-83 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better or metal, metal-framed plywood or other acceptable panel-type materials. Plywood shall be mill-oiled and edge-sealed, with each piece bearing legible inspection trademark. Furnish in largest practicable sizes to minimize number of joints. Provide form material with

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

B. Forms for Unexposed Finish Concrete: Use plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Forms for Round Piers or Columns: One-piece, disposable fiber forms or approved equal.

D. Void Forms: Wax treated fiber board, 4" height, designed to resist 1000 psf pressure.

E. Form Coatings: Commercial formulation that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

F. Chamfer Strips: 3/4" by 3/4" wood, PVC, or rubber.

G. Preformed Construction Joint: 24 gage steel, galvanized, shaped to form a continuous tongue and groove key.

H. Preformed Control Joint: Rigid plastic or metal strip with removable top section.

I. Expansion Joint Material: Asphalt saturated fiberboard, 1/2" thick, meeting the requirements of ASTM D 1751.

J. Felt: Asphalt-saturated organic felt, weighing 30 pounds per 100 square feet, meeting the requirements of ASTM D 226.

K. Waterstops: PVC, meeting the requirements of CRD-C572. Provide 6" wide dumbbell shape waterstop with 3/16 inch minimum web thickness and 3/8 inch minimum end bulb diameter.

PART 3 - EXECUTION

3.1. COORDINATION

A. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel. Set screeds accurately. Embedded items shall be accurately aligned and adequately supported. Verify installation of mechanical, plumbing, and electrical items to be embedded in concrete. Correct any unsatisfactory condition before proceeding further.

3.2. PREPARATION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

A. Form Coating: Coat contact surfaces of forms with a form-coating compound before reinforcement is placed. Thin form-coating compounds with thinning agent and apply as specified in manufacturer's instructions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed.

3.3. INSTALLATION

A. Formwork: Formwork shall support vertical and lateral loads that are applied until such loads can be supported by concrete structure. Formwork shall be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials. Construct forms to sizes, shapes, lines and dimensions shown. Perform surveys to obtain accurate alignment. Provide for recesses, chamfers, blocking, anchorages, inserts, and other features required in work. Select materials to obtain required finishes. Butt joints solidly and provide backup at joints to prevent leakage of cement paste.

B. Chamfer Strips: Provide at exposed corners and edges.

C. Form Ties: Use factory fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal.

D. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.4. INSTALLATION OF EMBEDDED ITEMS

A. General: Set anchorage devices and other embedded items accurately. Use setting drawings, diagrams, templates and printed instructions provided by supplier. Secure embedded items such that they are not displaced during placement of concrete.

B. Waterstops: Install according to manufacturers printed instructions. Splice waterstop sections using square cut butt joints and fuse sections together with indirect heat from preheated splicing iron. Use of direct flame is prohibited.

3.5. JOINTS

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints unless noted otherwise.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Keyways: Provide keyways at least 1-1/2" deep in construction joints in walls and slabs.

C. Preformed Construction Joint For Slabs on Grade: Secure with galvanized steel stakes, 1/8" thick by 1-1/8 inches wide with 1/2" deep rib and tapered point. Splice adjoining joints with 24 gage steel, galvanized splice plates.

D. Isolation Joints in Slabs on Grade: Construct isolation joints in interior slabs using 30 lb. felt. Provide isolation joints at points of contact between slabs on grade and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated. Construct isolation joints on exterior slabs abutting vertical surfaces with 1/2" thick expansion joint material.

E. Control Joints in Slabs-on-Grade:

1. Preformed Strip: Insert premolded rigid plastic, or metal strip into fresh concrete. Cut groove for strip using 10 foot long straight edge cutting tool. Depths of strip shall be one fourth of slab thickness. Press strip into groove such that top of strip is level with the concrete surface. Pull off removable top section, if any, prior to troweling.

2. Saw Cut: Contractor may saw cut control joints instead of using preformed strips. Saw cut joints shall be 1/8 inch wide. Saw cut depth should equal 1/3 of slab depth. Cut joints after concrete has hardened sufficiently to prevent raveling; usually 4 to 12 hours after slab has been cast and finished. Use diamond or silicone-carbide blades.

F. Control Joints in Walls: Create weakened planes in cantilevered retaining walls at 25 feet on center. Use preformed strips, placed vertically, full height in each face of wall. Depth of strips shall be one inch.

3.6. REMOVAL OF FORMWORK

A. General: Prevent excessive deflection, distortion, and damage to concrete when forms are stripped. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

B. Formwork and supports at sides of concrete shall remain in place for 24 hours after concrete placement. This period represents cumulative number of hours, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 degrees F. Formwork and shoring which support the weight of concrete shall not be removed until concrete has attained its specified compressive strength.

C. Ensure safety of the structure. Do not superimpose any load on concrete until forms are removed and concrete is cured.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.7. RE-USE OF FORMS

A. General: Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are intended for successive concrete placement, thoroughly clean surfaces and remove fins and laitance. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 03 2000

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1. WORK INCLUDED

A. This section includes fabrication and installation of deformed bar and welded wire fabric reinforcing steel.

1.2. RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 1100 – Concrete Formwork.

B. Section 03 3000 – Cast-In-Place Concrete.

1.3. QUALITY ASSURANCE

A. Reference Standards:

1. American Concrete Institute (ACI)

a.	ACI 301-96	Specifications for Structural Concrete for Buildings.
b.	ACI 315-92	Details and Detailing of Concrete Reinforcement.
c.	ACI 318-85	Building Code Requirements for Reinforced Concrete.

2. American Society for Testing and Materials (ASTM)

a.	ASTM A 82-95	Standard Specification for Steel Wire, Plain, For Concrete Reinforcement
b.	ASTM A 185-94	Standard Specification for Steel Welded Steel Wire Fabric, Plain, for Concrete Reinforcement
c.	ASTM A 615 A 615M-95b	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

3. Concrete Reinforcing Steel Institute (CRSI).

a. Manual of Standard Practice - 1992 Edition.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.4. SUBMITTALS

A. Shop Drawings: Submit shop drawings for reinforcing steel. Comply with ACI 315 requirements showing layout, bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of reinforcing steel. Shop Drawings shall not be made by reproduction of the Contract Drawings.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60. Stirrups and ties may be Grade 40.

B. Welded Wire Fabric: ASTM A 185, flat sheets.

C. Steel Wire: ASTM A 82, 16 gage.

D. Supports for Reinforcing Steel: Wire bar type and precast concrete block type meeting the requirements of CRSI Manual of Standard Practice.

E. Fibrous Reinforcing: 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials and specifically manufactured for use as concrete reinforcement at a minimum of 0.1% by volume for the control of cracking due to drying shrinkage and thermal expansion/contraction.

2.2. FABRICATION

A. Fabricate reinforcing steel in accordance with fabricating tolerances in ACI 315.

B. Do not fabricate reinforcing steel until shop drawings are approved.

PART 3 - EXECUTION

3.1. PLACING BAR SUPPORTS

A. General: Provide bar supports meeting the requirements of CRSI Specification for Placing Bar Supports.

B. Slabs-on-grade: Use supports with sand plates or precast concrete blocks or horizontal runners where base material will not support chair legs.

3.2. PLACING REINFORCING STEEL

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

A. General: Comply with CRSI Code of Standard Practice for "Placing Reinforcing Bars".

B. Clean reinforcing steel of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcing steel against displacement by formwork, construction, or concrete placement operations. Place reinforcing steel to obtain minimum coverages. Arrange, space and securely tie bars and bar supports to hold reinforcing steel in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

D. Concrete Cover:

1. Concrete cast against and permanently exposed to earth …..... 3"
2. Concrete exposed to earth or weather:
   Bars larger than No. 5 ..... 2"
   Bars No. 5 or smaller ..... 1 ½"
3. Columns or piers ..... 1 ½"

E. Rebar Splices: Locate at points of minimum stress or as shown on contract drawings. Unless noted otherwise, provide lap splices 30 bar diameters or 18" minimum length.

F. Welded Wire Fabric Splices: Lap one complete wire spacing.

G. Corner Reinforcing: Provide corner bars of same size and spacing as horizontal reinforcing steel. Lap with horizontal reinforcing 30 bar diameters or 18" minimum length.

H. Reinforcing at Construction/Control Joints: Continue reinforcing steel through construction joints unless noted otherwise. Discontinue reinforcing steel 2 inches from preformed construction joints in slabs-on-grade. Cut alternate longitudinal bars at weakened plane control joints in walls.

I. Fibrous Reinforcing:

1. Add fibrous concrete reinforcement to concrete materials at the time concrete is batched in amounts in accord with approved submittals for each type of concrete required.
2. Mix concrete in strict accord with fiber reinforcement manufacturer's instructions and recommendations for uniform and complete distribution.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 03 3000

CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.1. WORK INCLUDED

A. This section covers cast-in-place concrete including finishing, surface repair and curing.

1.2. RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 1100 – Concrete Formwork

B. Section 03 2000 – Concrete Reinforcement

1.3. QUALITY ASSURANCE

A. Reference Standards: Meet the requirements of the following codes, specifications and standards.

1. American Concrete Institute (ACI) Publications;

a. ACI 301-96 Specifications for Structural Concrete for Buildings.
b. ACI 306.1-90 Standard Specification for Cold Weather Concreting
c. ACI 318-95 Building Code Requirements for Reinforced Concrete.

2. American Society for Testing and Materials (ASTM);

a.	ASTM C 31-91	Standard Practice for Making and Curing Concrete Test C 31M-96 Specimens in the Field.
b.	ASTM C 33-97	Standard Specification for Concrete Aggregates.
c.	ASTM C 39-96	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
d.	ASTM C 94-97	Standard Specification for Ready-Mixed Concrete.
e.	ASTM C 131-96	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
f.	ASTM C 136-96a	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
g.	ASTM C 143-90a	Standard Test Method for Slump of Hydraulic Cement Concrete.
h.	ASTM C 150-97	Standard Specification for Portland Cement.
i.	ASTM C 171-97	Standard Specification for Sheet Materials for Curing Concrete.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

j.	ASTM C 172-97	Standard Practice for Sampling Freshly Mixed Concrete.
k.	ASTM C 173-94a	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
l.	ASTM C 231-97	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
m.	ASTM C 260-95	Standard Specification for Air Entraining Admixtures for Concrete
n.	ASTM C 309-97	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
o.	ASTM C 330-92	Standard Specification for Lightweight Aggregates for Structural Concrete
p.	ASTM C 494-92	Standard Specification for Chemical Admixtures for Concrete
q.	ASTM C 618-97	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
r.	ASTM D 2103-92	Standard Specification for Polyethylene Film and Sheeting
s.	ASTM D 4318-95a	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.4. SUBMITTALS

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and admixtures.

B. Concrete Mix Design:

1. Submit mix design in accordance with ACI-301, Section 4.
2. Submit with mix design results of laboratory tests performed within previous 6 months indicating aggregates from the proposed source comply with the requirements of ASTM C 33 or C 330 as applicable.

C. Test Reports: Submit copies of test reports for concrete compressive strength, air content, temperature and slump.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, low alkali. Use one brand of cement throughout project.

B. Normal Weight Aggregates: ASTM C 33. Provide aggregates from a single source for exposed concrete.

C. Water: Potable.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

D. Air-Entraining Admixture: ASTM C 260.

E. Water Reducing Admixture: ASTM C 494.

F. Fly-Ash: ASTM C 618, Class F.

G. Moisture-Retaining Cover: Provide waterproof paper, polyethylene film, or polyethylene-coatedburlap meeting the requirements of ASTM C 171.

H. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound meeting the requirements of ASTM C 309; Type 1-D with fugitive dye for interior concrete and foundations; Type 2, white pigmented, for exposed exterior concrete except exposed exterior Architectural concrete, use Type 1-D.

I. Granular base shall meet the following grading requirements when tested in accordance with ASTM C 136.

Sieve Size (Square Openings)	Percent Passing by Weight
1 inch	100
3/4 inch	70-100
No. 4	35-85
No. 200	0-10

The plasticity Index shall be no greater than 3 when tested in accordance with ASTM D 4318. The coarse aggregate shall have a percent wear of 50 or less when tested in accordance with ASTM C.

2.2. PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial mixture or field experience methods as specified in ACI 301, Section 4. If trial mixture method is used, employ an independent testing facility, acceptable to Architect, for preparing and reporting proposed mix designs.

B. Submit written reports to Architect, or Engineer, of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been approved.

C. Refer to the General Structural Notes for concrete strengths.

D. Admixtures:

1. Use air-entraining admixture in all concrete, except air entrainment may, be omitted from concrete to receive a steel trowel finish. The entrained air content for exterior concrete shall be 4 - 7 percent and for interior concrete the air content shall be 3 – 6 percent.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. Use water reducing admixture conforming to ASTM C 494, Type A, in all concrete unless approved otherwise by the Structural Engineer.

3. Use high range water reducing admixture conforming to ASTM C 494, Type F, in all concrete slabs unless approved otherwise by the Structural Engineer.

4. All other admixtures shall have the written approval of the Architect or Structural Engineer.

5. Calcium chloride is not permitted.

6. All admixtures, except high range water reducers, shall be added to the concrete at the batch plant.

7. Concrete for slabs to receive a steel trowel or float finish shall not contain both fly ash and high range water reducer.

PART 3 - EXECUTION

3.1. COORDINATION

A. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel. Set screeds accurately. Embedded items shall be accurately aligned and adequately supported. Verify installation of mechanical, plumbing, and electrical items to be embedded in concrete. Correct any unsatisfactory condition before proceeding further.

3.2. PREPARATION

A. Before placing concrete, clean and roughen surface of previously placed concrete. Clean reinforcing steel. Remove debris, providing clean-outs at bottom of forms when necessary. Moisten surfaces to receive concrete unless otherwise prepared. Remove excess water before placing concrete.

3.3. CONCRETE PLACEMENT

A. General: Comply with ACI 301.

B. Place concrete continuously in layers not deeper than 24 inches. Concrete shall not be placed against concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints. Deposit concrete as nearly as practicable to its final location to avoid segregation. Do not use vibrators to transport concrete.

C. Maintain reinforcing in proper position during concrete placement operations.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

D. Consolidate concrete, immediately after placing, by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

E. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface. Do not disturb slab surfaces prior to beginning finishing operations.

F. Cold Weather Concreting: Protect concrete work from physical damage or reduced strength caused by frost, freezing or low temperatures. Comply with ACI 306.1.

G. Hot Weather Concreting: When hot weather conditions exist that would impair quality and strength of concrete, reduce delivery time of ready mix concrete, lower the temperature of materials, or add retarder to ensure that the concrete is plastic. Retempering with water is not allowed.

3.4. FINISH OF FORMED SURFACES

A. Rough Form Finish: Provide where formed concrete surfaces are not exposed to view. Tie holes and surface imperfections shall be repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

3.5. FINISH OF HORIZONTAL SURFACES

A. At tops of foundation walls and grade beams finish with a texture matching adjacent formed surfaces unless otherwise indicated.

3.6. SLAB FINISHES

A. Float Finish: Begin floating when surface water has disappeared and when concrete has stiffened sufficiently to permit operation of power-driven or hand floats. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4" in 10' when tested with a 10' straightedge.

B. Scratch Finish: Apply scratch finish to slab surfaces that are to receive floor topping. Roughen surface before final set, using stiff brushes, or brooms.

C. Trowel Finish: Apply trowel finish to all slab surfaces unless noted otherwise. After floating, begin first trowel finish using a power-driven or hand trowel. Finish concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge.

D. Broom Finish: Apply on exterior slabs, ramps, steps, and sidewalks. Immediately after concrete has received a float finish, draw a broom or burlap belt across the surface to give a coarse transverse scored texture.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.7. CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Continue curing for at least 7 days using one of the following methods.

B. Moisture-retaining Cover curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed. Repair any holes or tears in cover during curing period. All concrete slabs are to be cured with moisture retaining cover for the first 24 hours. After that time the Contractor has the option to continue the moisture retaining cover, or remove the cover and apply liquid membrane-forming curing compound.

C. Curing compound: Apply curing compound uniformly in accordance with manufacturer's printed instructions.

3.8. CONCRETE SURFACE REPAIRS

A. Patching Surface Imperfections: Remove loose material and patch surface imperfections and holes left by tierods with cement mortar. Surface imperfections include honeycomb, excessive air voids, sand streaking and cracks.

3.9. FOR EXPOSED-TO-VIEW SURFACES

A. Blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

3.10. FIELD QUALITY CONTROL

A. The Contractor shall coordinate the services of a qualified testing laboratory to perform tests and submit test reports.

B. Sampling Fresh Concrete: ASTM C 172.

C. Slump: ASTM C 143; one test for each set of compressive strength test specimens.

D. Air Content: ASTM C 173 or C 231 for each set of compressive strength test specimens.

E. Concrete Temperature: Test hourly when air temperature is 40 degrees F. and below, when 80 degrees F and above; and when compression test specimens are made.

F. Compression Test Specimen: ASTM C 31, one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

laboratory cured test specimens except when field cure test specimens are required. Mold one set of standard cylinders for volume of concrete specified below or fraction thereof.

1.	Slabs on Grade or Metal Deck	30 cubic yards
2.	Footings and stem walls	50 cubic yards
3.	All other locations (unless noted otherwise)	30 cubic yards

G. Compressive Strength Tests: ASTM C 39; test 1 specimen at 7 days, 2 specimens at 28 days, and retain one specimen in reserve for later testing. Additional Tests: The testing laboratory will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure as directed by the Architect. The testing laboratory may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by the Architect or Engineer. The Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 04 2110

BRICK MASONRY

PART 1 - GENERAL

1.1. SUMMARY

A. The work covered by this division of specifications, in general, includes furnishing and installing all masonry materials; items specified in other divisions to be set in masonry shall be provided and installed under this division. Brick sidewalks shall be installed as per design patterns shown on the plans.

1.2. DESCRIPTION OF WORK

A. Brick paving shall be constructed in those areas as shown on the plans and/or as directed, and shall consist of brick placed on a sand-cement bed as shown on plans and/or as directed, and the joints filled with approved clean white silica sand. The exact pattern, brick size, and construction details shall be as shown on the plans.

1.3. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Product Data: Submit data indicating material specifications, characteristics, and instructions for using adhesives, grouts, mortars, and additives.

C. Samples: Showing the full range of colors available, and sizes, if applicable.

D. Submit manufacturer's installation instructions, if available.

E. Maintenance data: Include recommendations for cleaning and stain removal methods, and cleaning materials per Section 01 7000 – Execution Requirements.

F. Closeout Submittals:
   1. Submit manufacturer's complete maintenance data per Section 01 7700 – Closeout Procedures.
   2. Provide 2 copies of manufacturer's Maintenance Manual for complete care of masonry brick. Submit to Owner, through Architect, for review and approval.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

A. Materials used shall meet the following requirement:
   1. Masonry Cement- AASHO M-150Type II
   2. Preformed Bituminous Fiber Expansion Material – AASHO M-153 Type II or approved equal
   3. Brick – Kinney Brick Co. 3-5/8" x 2-1/4" x 7-5/8" Color: "S/W Summit Flint" or equal
   4. Sand – Fine aggregate for mortar shall meet the requirement of the AASHO Standard Specification for "Aggregate for Masonry Mortar" M-45 and shall be clean and free of salt
   5. Water – Water for mixing shall be potable, clean, and free from oil, acids, salts, and other deleterious matter

PART 3 - EXECUTION

3.1. CONSTRUCTION METHODS

A. Construction of brick paving, shall meet the following requirements:
   1. Sand Cement Bed – Sand-cement bedding course shall consist of sand and Portland Cement in the proportion of 1 part cement and 4 parts sand by weight, mixed dry until the mass is of uniform color. Mixing must be carried out at an approved batch mix plant. The contractor must furnish a batch ticket with each load, stating the correct batched weights of each material. Hand mixing will not be permitted.
   2. The bedding course shall be placed and shaped upon the prepared soils base so that its furnished depth shall not be less than 4 inches.
   3. The bedding shall be shaped to a true surface, parallel with surface of finished brick walkway, by means of template, and the bed shall be struck off until proper alignment is secured. The contractor shall coordinate his work so that the area of bedding course placed and rolled in any workday shall be scheduled so that no bedding course remains at the end of the day without the brick course placed.
   4. After final shaping, the bedding shall not be disturbed prior to laying the brick.
   5. Preformed bituminous fiber expansion joint material shall be furnished in areas as shown on the plansJoint sealers are to be placed as per plans and specifications.
   6. The brick shall be laid in successive coursed with the better face or wire-cut side upward.
   7. Each and every course of brick shall be laid true and even and brought to grade by use of wooden mallets or similar tools. No course shall deviate from a straight line more than 2 inches in 30 feet. Brick laying shall take place in a continuous sequence and shall follow the completion of the bedding within 50 feet.
   8. Immediately after placement of brick, brick surfaces shall be swept and inspected. Any imperfect brick as determined by the City Engineer shall be lifted out and reset.

B. Cutting Brick - Required cutting of bricks shall be accomplished with a mason's saw using a diamond blade or broken by brick hammer on an approved straight and even edge.

C. Sand Filler
   1. Joints shall be thoroughly chocked with a clean white fine grained silica sand.
   2. The sand filler shall be brought up flush with surface of bricks. After filling, bricks shall

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

be swept clean and carefully watered to saturate the joint filler, care being exercised not to displace filler form the joints. Any joints to which do not remain flush with brick surfaces shall be rechocked and watered, particular attention shall be paid to small section of cut brick necessary to fit manholes, light poles, water meters, tree planters, and any other obstructions within the sidewalk area.

3.2. CLEANING

A. The contractor shall remove from the roadway and sidewalk all excavated material, debris, and dirt as rapidly as the completion of the repair work proceeds and in no case will it be permissible for this material to remain as an obstruction or safety hazard overnight.

3.3. MASONRY WASTE DISPOSAL

A. Masonry Waste Disposal: Remove excess, clean masonry waste, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 05 0100

SHOP PREPARATION AND PRIMER PAINTING

PART 1 - GENERAL

1.1. SUMMARY

A. Primer and primer/finish painting for interior and exterior metal fabrications.

1.2. RELATED ITEMS:

A. Steel fabrications to be painted: Refer to Section 05 5000 – Metal Fabrications.

B. Field painting: Refer to Section 09 9100 – Paints and Coatings.

1.3. DEFINITIONS

A. Paint (PT): Paint systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as primer, intermediate, barrier or finish coats, and of various degrees of opacity or sheen.

B. Primer Coat: A provisional and impermanent shop-applied coating which promotes bonding of finish coat and is intended to protect the metal surface for a short period of exposure in ordinary atmospheric conditions.

C. Primer/Finish Coat: A shop-applied, self-priming coating which is intended as the primary means of metal protection.

D. Finish Coat: A field-applied topcoat component of a paint system.

E. Sheen: The specular gloss of a paint finish as determined in compliance with ASTM D523.

F. Paint System: One or more coats of paint, generally consisting of a prime coat and one or more coats of finish paint.

1. Paint system includes surface preparation and required pretreatment.

G. Dry Film Thickness (DFT): Specified by minimum thickness in mils, per coat, unless otherwise indicated.

H. Definition of Exposures: (General rule for paint system selection when not specifically scheduled or indicated).

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Exposed To View Protected Conditions: Surfaces and substrates that are shaded from direct sunlight and protected from direct precipitation.
2. Exposed To View Unprotected Conditions: Surfaces and substrates that are exposed to full sun and unprotected from precipitation.

1.4. PAINT SYSTEMS

A. Derive each paint system by:

1. Select primer from the specified products for the substrate involved. Touch-up of damaged shop- applied primers is a requirement of this Section.

2. Where "Industry Standard Primer" is specified, primer must be compatible with topcoat specified (if any) and shall be from same manufacturer as topcoat paint.

3. Select the topcoat(s) from the specified products for the type of finish and sheen scheduled. Refer to "Definitions" article for the key to abbreviations used in the schedules. Refer to Section 09 9100 – Paints and Coatings for specified standard and high performance topcoat paints.

B. Environmental and Chemical Exposure Classification:

1. Select paint systems that have been formulated to resist the following SSPC classifications:

   a. Environmental zone: Refer to SSPC Zone Map and recommendations.
   b. Chemical exposure: Refer to SSPC Zone Map and recommendations.

2. Demonstrated to inhibit mold or mildew growth.
3. Select systems that comply with VOC regulations of 2.8#/gallon.

C. Paint system primer and primer/finish coat shall have the following properties and meet the following performance requirements.

1. Surface Burning Characteristics: ASTM E 84; must meet Class A requirement for flame spread and smoke density in addition to NFPA 101.
2. Primer and primer/finish paints shall be corrosion resistant by one of the means indicated below:

   a. Chemically inhibits corrosion (rusting) by creating an alkaline condition on the steel surface.
   b. Inhibits corrosion (rusting) creating a by high-build film thickness barrier.
   c. Inhibits corrosion by creating a cathodic film.

3. Performance requirements of structural steel primers to receive high performance coatings:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

a. Adhesion: ASTM D3359 (Method B, 5 mm Crosshatch). Coatings systems applied to SSPC- SP10 Near-White Blast Cleaned steel and cured at 77F degrees and 50 percent R.H.; No less than a rating of 5. Adhesion: ASTM D4541, coating systems applied to SSPC-SP10 Near-White Blast Cleaned steel and cured 24 hours at 77F degrees and 50 percent R.H.; No less than 800 psi pull.
b. Exterior Exposure: Saltwater, splash and spray, coatings system applied to SSPC-SP10 Near- Blast Cleaned steel; No blistering, cracking, rusting or delamination of film after one year exposure.
c. Humidity: ASTM D4585, coating system applied to SSPC-SP10 Near-White Blast Cleaned steel and cured 14 days at 75F degrees and 50 percent R.H.; No blistering, cracking, rusting or delamination of film after 1,000 hours exposure.
d. Salt Spray (Fog): ASTM B117, coatings system applied to SSPC-SP10 Near-White Blast Cleaned steel and cured 17 days at 75 F degrees and 50 percent R.H.; No blistering, cracking, rusting or delamination of film. No rust creepage at scribe after 4,000 hours exposure.
e. Static Fatigue (Slip Coefficient and Tension Creep): Tests conducted in conformance with AISC specifications using equipment as described in the Research Council on Structural Connections Specifications, Appendix A, Section 4.1; Meets the requirements of a Class B surface with a mean slip coefficient no less than 0.50 and a tension creep not in excess of .005 inch.
f. Temperature Resistance: (Dry) Continuous 250 F degrees. Intermittent 300 F degrees.

1.5. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Product Data: Manufacturer's specifications and technical data of product/material proposed for use. Proposed products and materials shall be cross referenced to products specified.

C. Materials and Products List: List of products in same order and same generic name as listed in this Section. List proposed manufacturer and manufacturer's product name and number. Identify deviations, if any.

D. Color Samples: Submit 5 sets of samples for initial color selection in the form of manufacturer's color charts or 2 paper-backed samples, 3 by 5 inches.

1. After colors of materials have been selected, submit 5 samples 3 by 5 inches on not less than 20 gauge steel substrate, of each color and type of material selected. Samples will be reviewed for sheen as well as for color.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.6. QUALITY ASSURANCE

A. Mock-Up or Field Samples: Prepare Mock-ups or Field Samples for Architect's review and to establish requirements for ratings and finish texture.

1. Correct areas, modify method of application/installation , or adjust finish texture as directed by Architect to comply with specified requirements.
2. Maintain mock-ups and field sample accessible to serve as a standard of quality for this Section.
3. Sample shall consist of the following:

1.7. DELIVERY, STORAGE, AND HANDLING

A. Handling: Minimize handling until paint coating has cured to prevent abrasion and removal of paint coating.

B. Shipping: Deliver products/materials to site at such intervals to ensure uninterrupted progress of Work.

C. Storage and Protection:

1. Store products/materials to permit easy access for inspection and identification.
2. Keep products/materials off ground using pallets, platforms or other supports.

    a. Do not store products/materials in a manner that may cause distortion, discoloration or damage to products/materials or supporting structures. Repair or replace damaged products/materials and structures as directed.

3. Protect from the elements and from damage.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Acceptable Manufacturers:

1. Tnemec Company, Inc.

2. Comparable products, meeting the specified performance requirements, of the following manufacturers:

    a. Carboline Company.
    b. PPG Industries Inc.
    c. Sherwin Williams

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.2. PRIMERS

A. Metal Fabrications Primer for Concealed From View Conditions:

1. Tnemec Company, Inc.: Series 10, number 10-1009 (gray), 2.5 mil DFT.
2. Carboline Company: Series GP818 Primer Gray 0700, 2.5 mil DFT.
3. PPG Industries, Inc.: Series 6-208 Speedhide Rust Inhibitive Steel primer, 2.5 DFT.

B. Metal Fabrications Primer for Field Applied High Performance Coatings for Unprotected Conditions:

1. Tnemec Company, Inc.: Series 90-97 Tneme-Zinc, 2.5 to 3.5 mil DFT.
2. Carboline Company: Series 684 Urethane Zinc, 2.5 to 3.5 mil DFT.
3. PPG Industries: Moisture Cure Urethane Zinc Rich Primer #UC 65147/97-674, 3.0 mils DFT.

2.3. PRIMER/FINISH COAT

A. Metal Fabrications Primer/Finish Coat for Exposed To View Protected Conditions:

1. Tnemec Company, Inc.: Series 161 Tneme-Fascure, 4.0 to 6.0 mil DFT.
2. Carboline Company: Series 888, 4.0 to 6.0 mil DFT.
3. PPG Industries Inc.: Pitt-Guard Rapid-Coat DTR Epoxy #95-240 Series, 5.0 - 7.0 mils DFT.
4. Dry paint film thickness shall be not less than 4.0 mil.

B. Field applied topcoat not required for Primer/Finish paint systems.

2.4. TOP COAT FINISHES

A. Refer to Section 09 91 00 – Paints and Coatings for interior field applied finishes.

2.5. SOURCE QUALITY CONTROL

A. Tests and Inspections: Measure dry paint film thickness in shop using a magnetic gauge in compliance with procedures specified in SSPC-PA2, Section IV, Paint Thickness Measurement.

1. Take readings at random locations at a rate of not less than 5 readings per 100 square feet of surface.
2. Average of all readings for a given area or surface shall be within dry paint film thickness specified. No individual reading shall be more than 20 percent the specified thickness range, except where a minimum dry paint film thickness is specified.

3. Areas that are found to be below standard shall be marked and recoated to obtain the proper film thickness.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.

1. Do not proceed until unsatisfactory conditions have been corrected.

B. Verification of Assemblies: Verify fabrication and assembly of units is complete, including welding of units, before start of finishing operations. Finish surfaces of members and units exposed in final structure shall be free of markings, burrs and other defects.

1. Verify galvanizing of units specified to be galvanized has been completed and surfaces to be painted have been cleaned and prepared to receive finish.

3.2. PREPARATION

A. Clean steel in compliance with Steel Structures Painting Council "Surface Preparation Specifications". SSPC specifications indicated are minimum requirements for surface preparation. Where primer paint manufacturer requires a higher level of surface preparation, comply with most stringent requirements.

B. Surface Preparation: After inspection and before finishing clean units and members to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Correct other surface imperfections which may lead to premature failure of primer and primer/finish coatings. Clean steel in compliance with SSPC specifications indicated below:

1. SP-1 "Solvent Cleaning": Steel decking and galvanized surfaces.

a. Chemically power wash (Tri-Sodium Phosphate) galvanized surfaces to remove solvent and non-solvent soluble sealers and other surface contaminants.

2. SP-2 "Hand Tool Cleaning": Interior steel concealed or to be fireproofed and steel joists.

3.3. APPLICATION

A. Shop paint structural steel, steel deck, steel joists and accessory items, except those units or portions of units to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2 inches of embedded areas only.

1. Do not paint surfaces which are to be welded or high-strength bolted with slip-critical type connections.
2. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Protection: Protect surfaces not being painted concurrently, or not to be painted.

1. Apply masking tape or other protective covering before painting.
2. Remove protective coverings and masking tape when painting of surfaces or items is completed.

C. Painting: Immediately after surface preparation, apply primer paint and primer/finish paint in compliance with manufacturer's instructions to achieve dry film thickness specified. Use painting methods which result in continuous dry paint film thickness and full coverage of joints, corners, edges and exposed surfaces.

1. Apply 1 coat of primer or primer/finish to achieve dry film paint thickness specified, except as indicated below.
2. Where primed surfaces are inaccessible after assembly or erection, apply 2 coats of primer paint. This requirement does not apply to primer/finish primer.

3.4. CLEANING

A. Touch up and restore finishes where damaged prior to shipping. Remove spilled, splashed, or splattered paint from all surfaces without damaging them.

3.5. PROTECTION

A. Protect the Work, whether to be painted or not, against damage by painting and shop operations. Provide means to protect newly painted finishes. Remove masking tape and other protection media and its residue after painting.

1. Protect the Work prior to and during shipping to minimize damage to painted surfaces.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1. WORK INCLUDED

A. This section includes the fabrication and erection of structural steel.

1.2. RELATED SECTIONS

A. Section 05 5000 – Metal Fabrication

1.3. QUALITY ASSURANCE

A. Qualifications of Fabricator

1. Fabricator shall have a minimum of 5 years experience in the fabrication of structural steel and have a current AISC Certification for the fabrication facility.

2. Alternatively, the fabricator shall either
   a. Be a member of AISC and provide third party inspection of their fabrication process.
   b. Have a minimum of 10 years experience and provide third party inspection of their fabrication process.

B. Qualifications of Erector: Erector shall have a minimum of 5 years experience in the erection of structural steel.

C. Qualifications of Field Welders: Welders shall be certified in accordance with AWS D1.1 within the last 12 months.

D. Reference Standards:

1. American Society for Testing and Materials (ASTM)

   a. ASTM A 36 Standard Specification for Carbon Structural Steel. A 992
   b. ASTM A 53-95 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
   c. ASTM A 307-94 Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
   d. ASTM A 325-94 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

e. ASTM A 500-93 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

2. American Welding Society (AWS), latest edition.

a. AWS D1.1=92 Structural Welding Code-Steel.

3. American Institute of Steel Construction (AISC), Steel Construction Manual, latest edition.

a. Specification for Structural Steel Buildings
b. AISC Code of Standard Practice
c. Specification for Structural Joints Using ASTM A 325 or A 490 , Classes 10.9 and 10.9.3.

1.4. SUBMITTALS

A. Shop Drawings: Submit shop drawings including complete details and schedules for fabrication and assembly of structural steel members. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld. Shop drawings shall not be made by reproduction of the Contract Drawings.

B. Provide setting drawings and directions for installation of anchor bolts and other anchorages to be installed by others.

C. Welder Certification: Submit affidavit stating that all welders are certified in accordance with AWS.

1.5. PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Support structural steel above ground on skids, pallets, platforms, or other supports.

B. Protect steel from damage.

C. Store packaged materials in original unbroken package or container.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures.

E. Replace damaged shapes or members.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Structural Steel Shapes, Plates, and Bars: ASTM A 36 and A 992.

B. Structural Steel Pipe: ASTM A 53, Type E or S, Grade B.

C. Structural Steel Tubing: ASTM A 500, Grade B, Fy = 46 ksi.

D. Anchor Bolts: ASTM A 307 or ASTM A 36

E. High Strength Tension Control Threaded Fasteners: Meet requirements of ASTM A 325.

F. Headed Anchor Shear Studs: By the Nelson Division of TRW.

G. Welding Electrodes: E 70 Series.

H. Shop Primer Paint: Fabricators standard rust inhibitive primer.

I. Non-Metallic, Non-Shrink Grout: Meets the requirements of Corp of Engineers specifications CRD-C621.

2.2. FABRICATION

A. Fabrication shall be in accordance with the AISC "Code of Standard Practice for Buildings and Bridges".

B. Connections: Weld or bolt shop connections as indicated on the approved shop drawings. Design connections to support reactions and forces where indicated on the drawings.

C. Shop Welds: Shall be visually inspected by the Fabricator’s quality control department.

2.3. SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.

B. Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections.

C. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-1 "Solvent Cleaning"

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. SP-2 "Hand Tool Cleaning"

D. Painting: After surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions. Provide one coat.

PART 3 - EXECUTION

3.1. COORDINATION

A. Field Measurements: Verify all elevations, locations, and dimensions of surfaces to receive structural steel.

B. Anchor Bolts and Other Embedded Items: Verify locations and positions of anchor bolts and other embedded items used to support structural steel.

C. Correct any unsatisfactory conditions prior to erection of structural steel.

3.2. PREPARATION

A. Clean surfaces to receive structural steel prior to erection.

3.3. ERECTION

A. General: Erect structural steel in accordance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

B. Field Assembly: Assemble structural steel accurately to the lines and elevations shown on the drawings. Align and adjust components accurately before fastening.

C. Temporary Bracing: Provide temporary bracing or guys to secure structural steel against wind, seismic, or construction loads. It is the responsibility of the Contractor to maintain stability of the structure during erection.

D. Field Bolted Connections: Install high strength tension control bolts in accordance with AISC Specifications for Structural Joints Using ASTM A325 and A490 Bolts and the manufacturer's instructions. Where clearance within a connection does not permit the use of tension control bolts, standard A325 bolts shall be used and inspected in accordance with the AISC Specification for Structural Joints.

E. Field Welding: Perform all welds in accordance with AWS.

F. Inspection of Field Welds: Perform visual inspection of all field welds. If any welds appear to be unsatisfactory, they shall be tested in accordance with ASTM E160 and/or replaced at the expense of the Contractor.

G. Gas Cutting: Do not use gas cutting torches in field to cut structural framing.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

H. Do not enlarge unfair holes by burning. Ream holes that must be enlarged to admit bolts.

I. Field Touch-up Painting (Primer): Paint all bolts, washers, and nuts after connections have been tightened and checked. Paint field welds. Paint all abrasions in shop coat. Use same paint as for shop painting.

J. Grout Placement: Comply with the manufacturer's instructions.

K. Tighten anchor bolts after supported members have been positioned and plumbed.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 05 4000

LIGHTGAGE METAL FRAMING

PART 1 - GENERAL

1.1. WORK INCLUDED

A. This section includes all lightgage studs, joists and track, 20 gauge or heavier, including bridging, and related accessories as indicated on the Contract Drawings and specified herein.

1.2. RELATED WORK SPECIFIED ELSEWHERE

A. Section 09 2116 – Gypsum Board Assemblies.

1.3. QUALITY ASSURANCE

A. Reference Standards:

1. American Iron and Steel Institute (AISI) Design of Cold Formed Steel Structural Members, 1980.
2. American Welding Society of (AWS) D1.3, 1992 Structural Welding Code.
3. American Society of Testing and Materials (ASTM).

   a. ASTM A 570/ Standard Specification for Steel, Sheet and Strip, A 570M-95 Carbon, Hot Rolled, Structural Quality.
   b. ASTM A 611-94 Standard Specification for Steel, Sheet, Carbon, Cold Rolled, Structural Quality.
   c. ASTM A 653/Standard Specification for Steel Sheet, Zinc-Coated A 653M-95 (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.4. SUBMITTALS

B. Submit manufacturer's product information and installation instructions for each item of lightgage framing. Submit shop drawings for all prefabricated lightgage systems.

1.5. PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect metal framing units from rusting and damage. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type, and grade. Store off ground in a dry ventilated space or protect with suitable waterproof coverings.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Metal Framing:

1. All 12, 14, and 16 gage steel studs and joists shall be formed from steel that meets the requirements of one of the following standards with a minimum yield strength of 50,000 psi:

   a. Painted Material - ASTM A 570, Grade 50.
   b. Galvanized Material - ASTM A 653 Grade 50.

2. All 18 and 20 gage steel studs and joists; all track, bridging and accessories shall be formed from steel that meets the requirements of one of the following with a minimum yield strength of 33,000 psi:

   a. Painted Material - ASTM A 611, Grade C.
   b. Galvanized Material - ASTM A 653.

3. Material Finishes: All stud and joist components shall be primed with paint meeting the performance requirements of TT-P-1636C, or shall be formed from steel having a G-60 galvanized coating or better.

2.2. FABRICATION

A. Framing components may be prefabricated into panels prior to erection. Prefabricated panels shall be square, with components attached to prevent racking. Handling and lifting of panels shall be done in a manner as to not cause distortion in any member.

B. All framing components shall be cut squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Members shall be held positively in place until properly fastened.

PART 3 - EXECUTION

3.1. INSTALLATION

A. Install metal framing systems in accordance with manufacturer's printed instructions and recommendations, unless otherwise indicated on Contract Drawings.

B. Install and align tracks accurately to layout at base and tops of studs. Secure tracks as indicated on Contract Drawings. Provide fasteners at corners and ends of tracks.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Install supplementary framing, blocking and bracing in metal framing system to support fixtures, equipment, etc. Comply with stud manufacturer's recommendations and industry standards, considering weight and loading of each item.

D. Secure studs to top and bottom tracks by welding at both inside and outside flanges unless noted otherwise.

E. Frame wall openings larger than 2'-0" square with double studs at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

F. Install horizontal bridging in stud system, spaced (vertical distance) at no more than 4'-0" o.c. Weld at each intersection.

G. Touch-up shop-applied protective coatings damaged during handling and installation. Use compatible primer for prime coated surfaces; use galvanizing repair paint for galvanized surfaces.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 05 5000

METAL FABRICATIONS

PART 1 - GENERAL

1.1. WORK INCLUDED:

A. Furnish and install all metal fabrications as shown on Drawings and as specified under this Section.

1.2. RELATED SECTIONS:

A. Section 03 3000 – Cast-In-Place Concrete

B. Section 05 1200 – Structural Steel Framing

C. Section 09 9100 – Paints And Coatings

1.3. REFERENCES:

A. The references listed below are declared to be a part of these specifications, the same as if fully set forth, except as modified herein. Unless specifically stated otherwise, the edition or revision of each document in effect at the beginning of work on this project shall be used.

B. American Society for Testing and Materials (ASTM):

1. ASTM A6 - General Requirements of Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
2. ASTM A36 - Structural Steel
3. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc, Coated, Welded and Seamless
4. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality
5. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
6. ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products
7. ASTM A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled, Sheet and Strip, Commercial Quality
8. ASTM A668 - Steel Forgings, Carbon and Alloy, for General Industrial Use

C. American Welding Society (AWS)

1. AWS D1.1 - Structural Welding Code - Steel
2. AWS D1.3 - Structural Welding Code - Sheet Steel

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

D. American Institute of Steel Construction (AISC)

1. Manual of Steel Construction (1989)

E. Steel Structures Painting Council (SSPC)

1. SSPC-SP2 - Hand Tool Cleaning
2. SSPC-SP6 - Commercial Blast Cleaning

1.4. DEFINITIONS:

A. Definitions in ASTM E985 for railing-related terms apply to this section.

1.5. QUALITY ASSURANCE:

A. Codes and Standards: Comply with the provisions of the latest edition or revision of the following codes, standards and specifications, except as otherwise shown and specified.

1. AISC "Manual of Steel Construction – Allowable Stress Design"
2. AISI "Specification for the Design of Cold-Formed Steel Structural Members".
3. AWS D1.1, "Structural Welding Code - Steel" and D1.3 "Structural Welding Code - Sheet Steel".
4. ASTM A6, "General Requirements for Delivery of Rolled Steel Plates, Sheet Piling and Bars for Structural Use".

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedures".

C. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. Allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the work.

D. Inserts and Anchorages:

1. Furnish inserts and anchoring devices which must be set in concrete for the installation of miscellaneous metal work. Coordinate delivery with other work to avoid delay.
2. See concrete section of these specifications for installation of inserts and anchorage devices.

E. Shop Assembly: Preassemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.6. SYSTEM PERFORMANCE REQUIREMENTS:

A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

1.7. SUBMITTALS:

A. General: Comply with requirements of Section 01 3300 – Submittal Procedures.

B. Manufacturer's Data: Manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products. Indicate by transmittal that copy of instructions has been distributed to the installer.

C. Shop Drawings: Submit shop drawings for the fabrication and erection of all assemblies of miscellaneous metal work which are not completely shown by the manufacturer's data sheets. Include profile, elevations, sizes, connections, reinforcing and accessories at required for complete installation. Show welded connections using standard AWS welding symbols.

1.8. PROJECT CONDITIONS:

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.9. PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver to site as required to avoid interruption of work.

B. Store on blocking under shelters with supports as necessary to avoid damage due to self-weight or superimposed loads.

PART 2 - PRODUCTS

2.1. MATERIALS:

A. Steel

1. Plates and Shapes: ASTM A36 unless otherwise shown. ASTM A572, grade 50 where shown.
2. Pipe: ASTM A53, type E or S, grade B, black or galvanized as shown.
3. Steel Bars and Bar-Size Shapes: ASTM A283, Grade D or ASTM A36.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

4. Bolts, nuts, washers:

    a. Standard bolts: ASTM A307, grade A for general use, grade B for use at flanged joints of piping systems, plain or zinc coated as shown.
    b. Anchor bolts: Except as otherwise shown, L-shaped with minimum 3" hook, 8" embedment in concrete, 4" threaded projection, double nutted, ASTM A307 or A36, plain or zinc coated as shown.

B. Primer Paint:

1. For general use in shop and field: FS TT-P-31, brown
2. For touch-up of galvanized surfaces: FS TT-P-641
3. For aluminum to be in contact with steel: FS TT-P-645
4. For aluminum to be in contact with concrete: BuRec CTP-1

C. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

D. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A153.

E. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.2. FABRICATION - GENERAL:

A. Use materials of size and thickness shown, or, if not shown, of required size and thickness to produce adequate strength and durability in the finished product for the intended use. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for the various components of work.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise shown. Form bent-metal corners without otherwise impairing the work.

C. Weld corners and seams continuously and in accordance with the recommendations of AWS. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

D. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, use Phillips flathead (countersunk) screws or bolts.

E. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices as shown and as required to provide adequate support for intended use of the work.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

F. Cut, reinforce, drill and tap miscellaneous metal work as may be required to receive finish hardware and similar items of work.

2.3. STEEL FABRICATION:

A. General:

1. Conform to following standards of the American Institute of Steel Construction (AISC):

   a. "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings."
   b. "Code of Standard Practice for Steel Buildings and Bridges," with following exceptions:

      1) Connections shall be as shown on the Drawings except as specifically and individually approved otherwise by the Architect.

2. Welding shall conform to the AWS D1.1 "Structural Welding Code Steel" and AWS D1.3 "Structural Welding Code - Sheet Steel" and shall be performed by welders currently certified in accordance with AWS certification procedures to perform the type of welding required.
3. Mill bearing surfaces to true plane.
4. Shop connections: Welded, unless otherwise shown.
5. Field connections: Provide bolts for all field connections except where shown otherwise on Drawings.

B. Shop Painting:

1. Paint all steel items which are not specified or shown to be galvanized except as specified below. Paint after fabrication is complete. Exception: If portions of assemblages will not be accessible to painting after fabrication, paint those portions before fabrication.

2. Remove oil and grease, dirt, rust, loose mill scale, and other foreign elements by "Commercial Blast Cleaning" in accordance with SSPC-SP6 or by "Hand Tool Cleaning" in accordance with SSPC-SP2 as required.

3. Apply one or more coats of primer paint of specified type in accordance with paint manufacturer's directions as required to achieve recommended coverage and coating thickness for items to be used in a corrosive environment. Use painting methods which will result in full coverage of joints, corners, edges and all exposed surfaces.

4. Omit shop prime coat from contact surfaces of connections, from surfaces to be field welded, from parts to be embedded in concrete, and other parts which will not be exposed to view or weather after construction is complete.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Galvanizing:

1. Galvanize after fabrication all steel members and assemblages which are shown or specified to be galvanized.
2. Galvanize each item as specified. If coating type and thickness is not specified, provide hot-dipped galvanized coating equivalent to a G90 coating as specified in ASTM A525.
3. Protection of dissimilar materials:

a. Aluminum surfaces in contact with steel shall be given one coat of zinc chromate primer in accordance with FS TT-P-645.
b. Aluminum surfaces in contact with concrete shall be given coat of alkali-resistant bituminous paint meeting requirements of BuRec Specification CTP-1 (coal tar paint).

2.4. MISCELLANEOUS METAL ITEMS:

A. General: Provide and install items listed below and shown on drawings together with anchorage, attachment and accessories necessary for a complete installation. Items listed are principal items only. See drawing details for items not specifically listed.

B. Nosings: Furnish and install as detailed on Architectural Drawings.

C. Steel Pipe Railings and Handrails:

1. General: Fabricate pipe railings and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.

2. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

a. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.

3. Form changes in direction of railing members as follows:

a. By insertion of prefabricated elbow fittings.
b. By radius bends of radius indicated.
c. By mitering at elbow bends.
d. By bending.
e. By any method indicated above, applicable to change of direction involved.

4. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

deforming exposed surfaces of pipe.

5. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

6. Close exposed ends of pipe by welding 3/16 inch thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.

7. Toe Boards: Where indicated, provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or if not indicated, use 4 inches high x 1/8 inch steel plate welded to, and centered between, each railing post.

8. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

    a. For railing posts set in concrete fabricate sleeves from steel pipe not less than 6 inches long and with an inside diameter not less than 1/2 inch greater than the outside diameter of post, with steel plate closure welded to bottom of sleeve.

    b. Provide friction fit, removable covers designed to keep sleeves clean and hold top edge of sleeve 1/2 inch below finished surface of concrete.

2.5. CONCRETE FILL AND REINFORCING MATERIALS:

A. Concrete Materials and Properties: Comply with requirements of Division 3 section "Concrete Work" for normal weight, ready-mix concrete with minimum 28-day compressive strength of 3000 psi, unless higher strengths indicated.

B. Nonslip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rust-proof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

C. Reinforcing Bars: ASTM A615, Grade 60, unless otherwise indicated.

PART 3 - EXECUTION

3.1. PREPARATION:

A. Prior to beginning installation of metal fabrications, inspect field conditions under which work is to be done. If conditions are not satisfactory, do not begin work until unsatisfactory conditions have been corrected to the satisfaction of the Contractor and the Architect. Beginning of installation represents Contractor's acknowledgement and certification that all conditions are satisfactory.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Furnish setting drawings, diagrams, templates, instructions and directions for the installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the project site.

C. Thoroughly clean all parts which will be in contact.

D. Paint with specified paint all surfaces of dissimilar metals and any surfaces of aluminum fabrications which will be embedded in concrete.

3.2. INSTALLATION - GENERAL:

A. Install metal fabrication plumb and level or on slope as shown in their correct positions within specified tolerances.

B. Design, provide, install and maintain all temporary handrails, kickplates and other items as required by OSHA and as necessary to provide a safe workplace.

C. Use light drifting as necessary to draw holes together. Drifting to enlarge unfair holes is not permitted. If necessary to enlarge holes to make connections, use twist drills.

D. Weld steel members in accordance with AWS D1.1. Provide certification that all welders are currently qualified in accordance with AWS procedures.

E. Anchor handrails, ladders and miscellaneous items securely to supporting work as shown on the Drawings. Where attachments are not shown, anchor items using appropriate anchors subject to approval by the Architect.

F. Grout under baseplates to provide full bearing area after framing or equipment has been plumbed, leveled and aligned. Place grout in accordance with the manufacturer's directions using the damp-pack method. Do not apply loads to structural framing until grout under baseplates has been placed and properly cured.

G. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal items to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, lag bolts, wood screws and other connectors as required.

H. Cutting, Fitting and Placement:

1. Perform cutting, drilling and fitting required for the installation of miscellaneous metal items. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat. Do not weld, cut or abrade surfaces of exterior units which have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

I. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made and methods used in correcting welding work.

3.3. INSTALLATION OF STEEL PIPE RAILINGS AND HANDRAILS:

A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

1. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.
2. Nonshrink, nonmetallic grout or anchoring cement.
3. Cover anchorage joint with a round steel flange attached to post as follows:

A. Welded to post after placement of anchoring material.

1. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8 inch build-up, sloped away from post. For installations exposed on exterior, or to flow of water, seal anchoring material to comply with grout manufacturer's directions.

B. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.

1. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete. Accurately locate sockets to match post spacing.

C. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with pre-drilled hole for exposed bolt anchorage.
2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
3. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.4. INSTALLATION OF WALL HANDRAILS:

A. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.

B. Mount handrails only on gypsum board assemblies reinforced to receive anchors, and where the location of concealed anchor plates has been clearly marked for benefit of Installer.

3.5. FIELD PAINTING:

A. Apply one or more coats of the primer paint specified to cleaned surfaces of bolts, to new welds and to abrasions to shop coat after erection. Apply as many coats as necessary to achieve protection of the metal surfaces at least equal to that provided by the shop paint.

B. Apply finish paints and coatings as specified in Division 9 Sections of these specifications.

3.6. PROTECTION AND REPAIR OF WORK:

A. Take all measures necessary to protect the work during the life of the contract.

B. If any portion of the work is found to be defective or is damaged by the Contractor's operations after it has been installed, it shall be repaired by the Contractor at his expense as directed by and to the satisfaction of the Architect. If, in the opinion of the Architect, the work has been damaged to the extent that satisfactory repairs are not possible or if repairs have been made which are not acceptable, the Contractor shall remove the damaged items and replace with new undamaged items.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 06 1000

ROUGH CARPENTRY

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes the following:

1. Framing with engineered wood products.

2. Sheathing.

3. Plywood backing panels.

B. Related Sections include the following:

1. Section 06 2000 – Finish Carpentry.

2. Section 09 2116 – Gypsum Board Assemblies.

1.3. DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

B. Exposed Framing: Lumber not concealed by other construction.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority.
3. RIS - Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB - West Coast Lumber Inspection Bureau.
6. WWPA - Western Wood Products Association.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.4. SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.

3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.

1.5. QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Gypsum Sheathing Board:

    a. American Gypsum Co.

2. Metal Framing Anchors:

    a. Silver Metal Products, Inc.
    b. Simpson Strong-Tie Company, Inc.
    c. United Steel Products Company, Inc.

2.2. WOOD PRODUCTS, GENERAL

A. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Wood Structural Panels:

1. Oriented Strand Board: DOC PS 2.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
3. Comply with "Code Plus" provisions in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."
4. Factory mark panels according to indicated standard.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.3. WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: [AWPA C2 (lumber)] [and] [AWPA C9 (plywood)], except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and [one of] the following:

   a. Chromated copper arsenate (CCA).
   b. Ammoniacal copper zinc arsenate (ACZA).
   c. Ammoniacal, or amine, copper quat (ACQ).
   d. Copper bis (dimethyldithiocarbamate) (CDDC).
   e. Ammoniacal copper citrate (CC).
   f. Copper azole, Type A (CBA-A).
   g. Oxine copper (copper-8-quinolinolate) in a light petroleum solvent.

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of [19 percent for lumber] [and] [15 percent for plywood]. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece [or omit marking and provide certificates of treatment compliance issued by inspection agency].

D. Application: [Treat all rough carpentry, unless otherwise indicated.] [Treat items indicated on Drawings, and the following:]

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches (460 mm) above grade.
4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.4. FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in [AWPA C20 (lumber)] [and] [AWPA C27 (plywood)]. Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to [ASTM D 5664, for lumber] [and] [ASTM D 5516, for plywood].
2. Use treatment that does not promote corrosion of metal fasteners.
3. Use Exterior type for exterior locations and where indicated.
4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

B. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

2.5. MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction.

2.6. SHEATHING

A. Oriented-Strand-Board Wall and Roof Sheathing: Exposure 1 sheathing.

1. Span Rating: Not less than 24/16.
2. Thickness: Not less than 15/32 inch.

2.7. PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick.

2.8. FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.9. METAL FRAMING ANCHORS

A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:

1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.

2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

1. Use for exterior locations and where indicated.

D. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

PART 3 - EXECUTION

3.1. INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven fasteners.
2. Published requirements of metal framing anchor manufacturer.
3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code.
4. Table 2305.2, "Fastening Schedule," in the BOCA National Building Code.
5. Table 2306.1, "Fastening Schedule," in the Standard Building Code.
6. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in the International One- and Two-Family Dwelling Code.

D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

E. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2. WOOD FRAMING INSTALLATION, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Do not splice structural members between supports.

3.3. WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated. Comply with "Code Plus" provisions in above-referenced guide.

B. Fastening Methods: Fasten panels as indicated below:

1. Sheathing:
   a. Screw to cold-formed metal framing.
   b. Space panels 1/8 inch apart at edges and ends.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. Plywood Backing Panels: Nail or screw to supports.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 06 2000

FINISH CARPENTRY

PART 1 – GENERAL

1.1. DESCRIPTION

A. This section specifies exterior and interior millwork.

1.2. RELATED WORK

A. Section 05 5000 – Metal Fabrications: Fabricated Metal brackets, bench supports and countertop legs.

B. Section 06 1000 – Rough Carpentry: Framing, furring and blocking.

C. Section 08 1416 – Flush Wood Doors: Wood doors.

E. Section 06 4500 – Custom Plastic Laminate Casework: Casework.

G. Division 26 – Electrical: Electrical light fixtures and duplex outlets.

1.3. SUBMITTALS

A. Submit in accordance with Section 01 3300 – Submittal Procedures.

B. Shop Drawings:

1. Millwork items – Half full size scale for sections and details 1:50 (1/4-inch) for elevations and plans.
2. Show construction and installation.

C. Samples: Finished plywood, (six by twelve inches).

D. Certificates:

1. Indicating // preservative treatment // fire retardant treatment // of materials meet the requirements specified.
2. Indicating moisture content of materials meet the requirements specified.

F. Manufacturer's literature and data:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Finish hardware
2. Electrical components

1.4. DELIVERY, STORAGE AND HANDLING

A. Protect lumber and millwork from dampness, maintaining moisture content specified both during and after delivery at site.

B. Store finishing lumber and millwork in weathertight well ventilated structures or in space in existing buildings designated by Resident Engineer. Store at a minimum temperature of 21^0C (70^0F) for not less than 10 days before installation.

C. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

1.5. APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society of Testing and Materials (ASTM):

A36/A36M-08.....Structural Steel

C. Hardwood Plywood and Veneer Association (HPVA):

HP1-09.....Hardwood and Decorative Plywood

D. American Wood-Preservers' Association (AWPA):

AWPA C1-03.....All Timber Products – Preservative Treatment by Pressure Processes

E. Architectural Woodwork Institute (AWI):

AWI-09.....Architectural Woodwork Quality Standards and Quality Certification Program

F. National Electrical Manufacturers Association (NEMA):

LD 3-05.....High-Pressure Decorative Laminates

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 2 – PRODUCTS

2.1. LUMBER

A. Grading and Marking:

1. Lumber shall bear the grade mark, stamp, or other identifying marks indicating grades of material.

2. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.

3. The inspection agency for lumber shall be approved by the Board of Review, American Lumber Standards Committee, to grade species used.

B. Sizes:

1. Lumber Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which product is produced.
2. Millwork, standing and running trim, and rails: Actual size as shown or specified.

C. Hardwood: MM-L-736, species as specified for each item.

D. Softwood: PS-20, exposed to view appearance grades:

1. Use C select or D select, vertical grain for transparent finish including stain transparent finish.
2. Use Prime for painted or opaque finish.

E. Use edge grain Wood members exposed to weather.

2.2. HARDWARE

A. Rough Hardware:

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electric-galvanizing process. Galvanized where specified.

2. Use galvanized coating on ferrous metal for exterior work unless non-ferrous metals or stainless is used.

3. Fasteners:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

a. Bolts with Nuts: FF-N-836.
b. Expansion Bolts: A-A-1922A.
c. Screws: Fed. Spec. FF-S-111.

2.4. MOISTURE CONTENT

A. Moisture content of lumber and millwork at time of delivery to site.

1. Interior finish lumber, trim, and millwork 32 mm (1-1/4 inches) or less in nominal thickness: 12 percent on 85 percent of the pieces and 15 percent on the remainder.
2. Exterior treated or untreated finish lumber and trim 100 mm (4 inches) or less in nominal thickness: 15 percent.
3. Moisture content of other materials shall be in accordance with the standards under which the products are produced.

2.5. FABRICATION

A. General:

1. Except as otherwise specified, use AWI Custom Grade for architectural woodwork and interior millwork.
2. Finish woodwork shall be free from pitch pockets.
3. Plywood shall be not less than 13 mm (3/4 inch), unless otherwise shown or specified.
5. Edges of members in contact with concrete or masonry shall have a square corner caulking rebate.
6. Interior trim and items of millwork to be painted may be fabricated from jointed, built-up, or laminated members, unless otherwise shown on drawings or specified.

PART 3 - EXECUTION

3.1. ENVIRONMENTAL REQUIREMENTS

A. Maintain work areas and storage areas to a minimum temperature of 70^0F for not less than 10 days before and during installation of interior millwork.

B. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

3.2. INSTALLATION

A. General:

1. Millwork receiving transparent finish shall be primed and back-painted on concealed surfaces. Set no millwork until primed and back-painted.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. Secure trim with fine finishing nails, screws, or glue as required.
3. Set nails for putty stopping. Use washers under bolt heads where no other bearing plate occurs.
4. Seal cut edges of preservative and fire retardant treated wood materials with a certified acceptable sealer.
5. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.
6. Plumb and level items unless shown otherwise.
7. Nail finish at each blocking, lookout, or other nailer and intermediate points; toggle or expansion bolt in place where nails are not suitable.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 06 4500

CUSTOM PLASTIC LAMINATE CASEWORK

PART 1 - GENERAL

1.1. SUMMARY OF THE WORK:

Furnish delivered to job site, unloaded, set in place, leveled and scribed, the work of this Section as indicated on the drawings and as specified and required for a complete installation.

1.2. SECTION INCLUDES:

A. Custom casework: high pressure decorative laminate finish

B. Countertops: high pressure decorative laminate finish and Stainless steel finish

C. Hardware customarily furnished by the casework manufacturer

D. Installation

1.3. RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry: Wood blocking, and grounds within finished walls and above finished ceiling

B. Section 06 20 00 – Finish Carpentry: Wood trim

C. Section 05 5000 – Metal Fabrications

D. Section 07 9000 – Joint Sealants

E. Division 10 – Specialties

H. Division 15 – Mechanical Section

I. Division 16 – Electrical Section

1.4. REFERENCES

A. Architectural Woodwork Institute, AWI Quality Standards, current edition

B. ANSI/BHMA A156.9 - Cabinet hardware

C. NEMA LD3 - High pressure decorative laminate

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

D. Particleboard – ANSI 208.1 (American National Standards Institute)

E. Softwood plywood – US Products Standards PS1

F. Hardboard – ANSI AHA 135.484 (American Hardboard Association)

G. PVA adhesive (polyvinyl acetate) white glue, Type II ASTM-D3110

H. Aliphatic adhesive (carpenter's glue) Type II

I. Solvent-based contact cement MMM-A-J1308

1.5. SUBMITTALS

A. Submit as required in Section 01 3300 – Submittal Procedures.

B. SHOP DRAWINGS:

1. Prior to commencement of work under this section, submit copies as required in Section 01 3300 – Submittal Procedures.
2. Submit plans and elevations indicating materials, profiles, assembly methods, joint details, fastening methods, and schedule of finishes. Include hardware cut sheets and lock schedules.
3. Submit drawings with dimensions in units of feet and inches.

C. SAMPLES:

1. Submit a selected manufacturer's current full range of colors and patterns identifying those colors and patterns with premium costs.
2. Submit one sample of each type of required hardware in specified finish.
3. Submit one set of samples showing the current full range of colors for 0.5mm and 3mm PVC edge banding for selection by the Architect.

1.6. QUALITY ASSURANCE

A. Perform work in accordance with AWI Quality Standards, current addition.

B. Work in this Section shall comply with the specified Grade(s) or Work and Section(s) of the current edition of the Architectural Woodwork Institute Quality Standards.

C. Woodwork manufacturers shall be certified by the AWI Quality Certification Program as competent to perform the work specified.

D. Certification shall be evidenced through the application of AWI Quality Certification labels and/or the issuance of an AWI letter of certification for the project. QCP Registration # _____.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

Architect Note: CALL AWI QUALITY CERTIFICATION PROGRAM (800) 449-8811 FOR PROJECT REGISTRATION NUMBER PRIOR TO BID or REGISTER ONLINE @ awinet.org

E. Contractors and their personnel engaged in the work of this section shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified.

1.7. DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site in a timely manner to ensure uninterrupted progress. Deliver all products with protective covering to prevent damage. Promptly remove damaged materials from job site and make timely replacements.

B. Protect units from moisture damage according to AWI Quality Standards, Section 1700, Installation.

C. Environmental Limitations: Do not deliver or install wood work until building is enclosed, wet work is complete, and HVAC is operating and maintaining designed temperature and relative humidity levels for the remainder of the construction period.

1.8. COORDINATION

A. Coordinate work of this Section with other applicable trades.

B. Pre-cut rough-ins for plumbing, electrical and data wherever possible.

1.9. FIELD MEASUREMENTS

A. Where casework is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings.

1.10. WARRANTY.

A. Provide a written warranty that all casework materials and workmanship will be free from defects for a period of one year from the date of Substantial Completion of the project. Any defective work is to be repaired or replaced at no cost to the Owner.

PART 2 - PRODUCTS

2.1. APPROVED MANUFACTURERS:

A. The following manufacturers are approved for use based upon their being current participants in the Quality Certification Program (QCP) of the Architectural Woodwork Institute (AWI). If other manufacturers are current participants in the QCP, they may submit for Prior Approval as approved manufacturers:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Albuquerque Cabinets, Inc.: 4800 Hawkins NE, Albuquerque, NM 87109.
2. Calmar Manufacturing Co. Inc (Tru-Bilt brand): Calmar, Iowa - Represented by Institutional Products, LLC 230 Cynthia Loop NW, Suite C, Albuquerque, NM 87114.
3. Casework Technologies, Ltd. Co.: 709 Haines Ave. NW, Albuquerque, NM 87102.
4. Fame Manufacturing / New Mexico School Products: 3020 Princeton NE, PO Box 2126, Albuquerque, NM 87103.
5. Imperial Casework, Inc.: 2716 Chico Street, El Paso, TX 79903-3702.
6. LSI Corporation of America: Minneapolis, Minnesota. Represented by Indeco Sales, Inc., 805 East 4th Ave., Belton, TX 76513 and by Aesop's Gables, 4810 Pan American NE, Albuquerque, NM 87109.
7. O.G.B. Architectural Millwork: 3711 Paseo Del Norte, Suite B, Albuquerque, NM 87113.
8. Techline USA: Waunakee, Wisconsin. Represented by P&M Caseworks, LLC, 4100 Menaul Blvd NE, Albuquerque, NM 87110.
9. TMI Systems Design Corporation: Dickinson, North Dakota. Represented by Institutional Products, LLC, 230 Cynthia Loop NW, Albuquerque, NM 87114.
10. Westmark Casework: Tacoma, Washington - Represented by A.C.I.E., 4800 Hawkins NE, Albuquerque, NM 87109.

2.2. SHEET MATERIALS

A. SOFTWOOD PLYWOOD: Graded in accordance with AWI Grade Custom.

B. WOOD PARTICLEBOARD AND/OR FIBERBOARD: Shall be Industrial Grade Medium Density, complying with current ANSI A208.1 9 (particle board) or ANSI A208.2 (fiberboard), and shall be a “45 lb” board.

C. THERMOSET DECORATIVE OVERLAY: Particleboard or medium density fiberboard with surface of thermally fused, melamine–impregnated decorative paper complying with LMA SAT-1. Color: Grey

2.3. HIGH PRESSURE DECORATIVE LAMINATE

A. AVAILABLE MANUFACTURERS: Subject to compliance with requirements, manufacturers offering high pressure decorative laminate that may be incorporated into the work include:

1. Formica Corporation www.formica.com
2. Wilsonart International www.wilsonart.com
3. Nevamar Company www.nevamar.com

2.4. LAMINATE COLORS AND PATTERNS

A. In the absence of a specified laminate pattern and/or color, furnish non-premium-priced decorative laminates from manufacturer’s standard selections, maximum of four different colors and/or patterns per project, limited to one color/pattern for cabinet and one

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

color/pattern for countertop per elevation. When specified, furnish multiple patterns, colors and/or specialty materials.

2.5. HARDWARE

A. CLASSROOM CABINETRY

1. Hinges: Provide hinges from one of the following listed Brands:

   a. MEPLA – SSP 73 Hinge System.
   b. GRASS - Series 9000 Institutional Hinge System

2. Quantity of hinges per door as required by the manufacturer's specifications.

B. OFFICE CABINETRY

1. Hinges: Provide hinges from one of the following listed Brands:

   a. MEPLA – Model SSP 29, 125 deg. slide on hinge.
   b. GRASS – Series 3803, 120 deg. snap on hinge.
   c. BLUM – 120 deg. clip on hinge.

2. Quantity of hinges per door as required by the manufacturer's specifications.

C. PULLS

1. Door and drawer pulls shall be wire pulls
2. Color shall be bronze anodized.
3. Substitutions for the above products shall be submitted for approval prior to bidding in accordance with the requirements of Section 01 6300 – Product Substitution Procedures

D. LOCKS: Provide on all doors and drawers. Brand: TIMBERLINE Cam Lock, Model CB-080 through 199 series. Locks to have a Bezel. Strike plates used where appropriate.

1. Keying Requirements: All locks in a single room shall be keyed alike. Locks shall be keyed different from room to room. Provide 2 master keys.

E. LATCHES: EPCO Model number 1018-N. Use on inactive door opposite locks.

F. DRAWER SLIDES: Drawer slides for all standard drawers shall be regular extension epoxy coated steel modular system by one of the following:

1. BLUM METABOX; Drawer System 320 & 330 Series. Color, white.
2. GRASS ZARGON; Drawer System 6000 Series. Color, white.
3. MEPLA INTEGRA; Drawer System "Integra Top" Clip on.
4. Where shown in drawings, file drawers shall have full extension slides and standard file hangers with option for letter or legal size files.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

G. CASEWORK SHELF SUPPORTS: Bainbridge Mfg, 5mm dual pin part #3220 or equal.

H. HORIZONTAL DIVIDER SUPPORTS: Hafele 5mm steel wire ("magic wire"). Furnish in size appropriate to shelf size.

1. To back side of cabinet door with mirror clips.

I. COUNTERTOP WIRING GROMMETS: 2 1/2" diameter with covers. Color black unless otherwise noted.

PART 3 - EXECUTION

3.1. FABRICATION - CABINET COMPONENTS

A. GENERAL:

1. Comply with the AWI Quality Standards (latest edition) Custom Grade.
2. Reference Section 400-G-3, Identification of Parts, for the criteria of exposed and semi-exposed surfaces.
3. Cabinet width dimensions are not to exceed 32" for both wall cabinets and base cabinets. Sink base cabinets and Map drawer cabinets will be the only exceptions.
4. Office Cabinetry style shall be constructed per Section 400-G-7, A; Flush Overlay.
5. Classroom cabinetry style shall be constructed per Section 400-G-7, B; Reveal Overlay.

B. DRAWERS:

1. Drawer fronts shall be 3/4" thick particleboard overlaid with high-pressure plastic laminate on both faces. Edges are banded with 3mm PVC with outer edges 1/8" radius. PVC edge colors shall be chosen from the submitted range to compliment or match the face color.

2. Steel Drawer Systems: Drawer bottoms and backs shall be 3/4" thick thermo fused melamine. Color to match cabinet interior. Edges are banded with .5mm PVC color to match cabinet interior.

3. Built Drawer Boxes:

a. Drawer sides, sub front and backs shall be 1/2" thick minimum thermofused melamine. Color to match cabinet interior. Edges are banded with .5mm PVC color to match cabinet interior.

b. Drawer bottoms shall be 1/2" thick minimum thermofused melamine. Color to match cabinet interior. Sides are rabbeted to accept bottom and bottom is to be glued and screwed as well as supported by screws from the bottom mount slides.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. DOORS: Doors shall be 3/4" thick particleboard overlaid with a high-pressure plastic laminate on both faces. Edges shall be banded 3mm PVC with outer edges 1/8" radius. PVC edge colors shall be from the selected range to either match or compliment the face color.

D. CABINET ENDS, TOPS & BOTTOMS:

1. All panels shall be constructed with 3/4" particleboard as the core material.

2. At Semi-exposed (see AWI standards for definition and locations) ends, tops or bottoms the particleboard shall be overlaid with thermofused melamine on the exterior face.

3. At Exposed (see AWI standards for definition and locations) ends, tops or bottoms, the particleboard shall be overlaid with a high pressure decorative laminate on exposed faces. The inside color shall match the cabinet interior with the face color to match exterior color. The front edges shall be banded with .5mm PVC in color as selected by the Architect from the colors submitted.

4. In cabinets with doors, the interior surfaces of the particleboard shall be overlaid with either high pressure laminate cabinet liner or thermofused melamine. The color shall match the melamine surfaced back color. The front edges shall be banded with .5mm PVC to match exposed face color or as selected by the Architect from the colors submitted.

5. In open cabinets (without doors), the interior surfaces of the particleboard shall be overlaid with high pressure decorative to match exposed exterior color. The front edges shall be banded with .5mm PVC to match exposed face color or as selected by the Architect from the colors submitted.

6. All end panels shall be drilled for adjustable shelf supports with .5mm diameter holes on 32mm (1 1/4") centers. For shelves up to and including 30" depth, two vertical sets of holes shall be provided at each end panel. For shelves over 30" deep, three vertical sets of holes shall be provided at each end panel.

E. FIXED AND ADJUSTABLE SHELVES:

1. Semi-exposed Shelves: Regardless of cabinet width, all shelves shall be 1" thick particleboard overlaid with thermofused melamine on top and bottom faces. Color to match cabinet interior.

2. Exposed Shelves: Regardless of cabinet width, all shelves shall be 1" particleboard overlaid with high pressure decorative laminate. Color to match exterior unless otherwise noted on the drawings.

3. All four edges of adjustable shelves and front edge of fixed shelves shall be banded with 0.5mm edge banding in color to match shelf color or as selected by the Architect from the colors submitted.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

F. CABINET BACKS:

1. All semi-exposed cabinet backs shall be 3/4" thick minimum thermofused melamine. Color to match cabinet interior.

2. All exposed backs shall be 3/4" thick minimum particleboard overlaid with a high-pressure plastic laminate. Color to match exterior for exposed backs.

3. Provide removable backs for service access where shown on the project drawings.

4. All backs shall be full bound by all sides, tops and bottoms of the cabinet.

G. DIVIDERS AND PARTITIONS:

1. Vertical dividers and partitions shall be 3/4" particleboard overlaid with thermofused melamine on both faces when semi-exposed and high pressure decorative laminate for exposed surfaces. The exposed edges shall be banded with .5mm PVC to match the other case edges.

2. Fixed Horizontal Dividers: Where indicated on the drawings, dividers less than 6" apart and less than 12" wide shall be 1/4" tempered hardboard grooved into adjacent cabinet members. The edges shall be sanded and entire shelf clear sealed.

3. Adjustable Horizontal Dividers: Where indicated on the drawings, dividers shall be 3/4" particleboard overlaid with thermofused melamine on both faces when semi-exposed and high pressure decorative laminate for exposed surfaces. Dividers shall be grooved to accept steel "magic wire" supports. The exposed edges shall be banded with .5mm PVC to match the other case edges

H. CABINET TOE BASES:

1. Cabinet bases shall be 4" standard heigh made in continuous lengths to ensure straight, level and true line of casework. The standard core materials shall be 3/4" particleboard. In rooms with floor drains, the core material shall be "Medex" MDF board or equal.

2. Bases shall be unfinished and ready for scheduled base finish to be applied.

3.2. FABRICATION - COUNTER TOPS

A. GENERAL:

1. Comply with the AWI Quality Standards (latest edition) Custom Grade. Reference Section 400C.

2. Decorative laminate counter tops shall be PF42 NEMA grade laminate with .020" backing sheet bonded to 3/4" particleboard substrate. Adhesives shall be either Type II PVA or contact cement depending on the size of the materials and job conditions.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3. Decorative laminate color selections shall be as selected from manufacturer's non-premium-priced patterns and colors. Reference Part 2, Section 2.2 and 2.3 for manufacturer brands and color quantity requirements.

4. Counter top thickness shall be as noted in Section B. below.

5. Where tops and back splashes in which sinks occur, utilize an industrial grade particle board or fiberboard with a 24 hour thickness swell factor of 5% or less and a 24 hour water absorption factor of 10% or less.

6. Counter tops shall be furnished in the longest lengths possible. When joints are required, they shall be factory prepared with a minimum of three 1/4" joint bolts each. Joints shall be field assembled with waterproof sealant to ensure stable and rigid construction. Avoid joints within 24" of sinks or knee spaces.

B. COUNTERTOP OPTIONS:

1. PVC Edged Decorative Laminate Counter Tops.

a. Where called for on the drawings, overall counter top thickness shall be 1 1/4" with buildup added to the substrate. Standard overhang from cabinet body along front shall be 1 1/2". Exposed end overhang shall be 1/2".

b. Front edge of counter tops shall have 3mm PVC edge banding. Edge colors shall be from a select range to either match or compliment the top color.

c. Back splashes shall be 3/4" thick and 4" high edged with same 3mm PVC banding as front edge unless specified otherwise.

2. Solid Surface per finish schedule.

3.3. EXAMINATION

A. Verify adequacy of in wall backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work

C. Before installing architectural woodwork, examine shop fabricated work for completion and complete work as required, including back priming and removal of packing.

D. Condition building and woodwork to average prevailing humidity conditions in installation areas before installing.

3.4. INSTALLATION

A. Install work in accordance with AWI Quality Standards (latest edition) Section 1700. Grade

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

Custom.

B. Set and secure materials and components in place, plumb and level. Shim as required with concealed shims.

C. Scribe work abutting other components or work. Refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, strapping and blocking with countersunk, concealed fasteners with blind nailing where possible for a complete installation.

E. CABINETS: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

F. TOPS: Anchor securely to base units and other support systems as indicated. Caulk space between backsplash and wall with specified sealant.

3.5. ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.

3.6. PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 07 2113

RIGID INSULATION

PART 1 - GENERAL

1.1. SUMMARY

A. Rigid insulation.

1.2. RELATED SECTIONS:

A. Section 07 2116 – Fiberglass Insulation: Sound attenuated and blown insulation.

B. Insulation of mechanical items: Refer to Division 22.

1.3. REFERENCES

A. ASTM C665 - Mineral Fiber Blanket Insulation for Light Frame Construction and Manufactured Housing.

B. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.

C. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

D. ASTM E84 - Surface Burning Characteristics of Building Materials.

E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials

F. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Deg Centigrade.

G. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics

H. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

I. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation

J. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

K. ASTM C739 - Standard Specification for Cellulosic Fiber (Wood Base) Loose Fill Thermal Insulation

L. ASTM C764 - Standard Specification for Mineral Fiber Loose Fill Thermal Insulation

M. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

1.4. QUALITY ASSURANCE

A. Thermal Resistivity: Thermal resistivity properties of insulation materials are designated by R- values represent rate of heat flow through a homogenous material exactly 1 inch thick, measured by test method include in referenced material standard or otherwise indicated. These are expressed by the temperature difference in degrees F, between the 2 exposed faces required to cause 1 BTU to flow through 1 square foot per hour at mean temperatures indicated.

B. Fire Performance Characteristics: Provide insulation materials that are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Surface Burning Characteristics: ASTM E84.
2. Fire Resistance Ratings: ASTM E119.
3. Combustion Characteristics: ASTM E136.

C. Maximum Allowable Asbestos Content of Inorganic Insulation: Provide insulation composed of mineral fibers or mineral ores which contain less than 0.25 percent by weight of any type or mixture of types occurring naturally as impurities as determined by polarized light microscopy test per Appendix A of 40 CFR 763.

1.5. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Comply with Section 01 1000 – Summary.

C. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation and vapor retarder material required.

D. Certified test reports clearly indicating compliance with 'R' requirements at 75 degrees F.

E. Contract Closeout Submittals: Comply with Section 01 7700 – Closeout Procedures.

1. Submit insulator certification as specified herein.
2. Submit insulation certification and identification labels.

    a. Certifications shall indicate "R" value and installed thickness.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

b. Provide 2 copies with submittals required in Section 01 7700 – Closeout Procedures.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 6000 – Product Requirements.

B. Deliver materials to Project site in manufacturer's original, unopened packages that are correctly labeled.

C. General Protection: Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

D. Protection for Plastic Insulation:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition. Do not deliver plastic insulating materials to Project site ahead of installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of Work.

1.7. PROJECT CONDITIONS

A. Environmental Conditions:

1. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Owens Corning
2. ACH Foam Technologies
3. Or Equal.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.2. PRODUCT

1. Model: Foamular 150
2. Compressive Strength: 15 psi
3. Density: NA
4. Fire Rating Class: NA
5. Flame Spread: 5
6. Smoke Developed: 45-175
7. Standard: ASTM C578
8. Thermal Resistance: R-5.0 per inch (at 75 degrees mean temp)
9. Thickness: 2"
10. Type of Insulation: Extruded Polystyrene Insulation

A. General: Provide insulating materials that comply with requirements and with referenced standards.

B. Refer to Insulation Schedule for products required of this Section.

2.3. AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

B. Protection Board: Premolded, semirigid asphalt/fiber composition board, 1/4 inch thick, formed under heat and pressure, of standard sizes.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.

C. Verify substrate surface is flat, free of filings and irregularities.

3.2. PREPARATION

A. Require Installer to examine substrates and conditions under which insulation Work is to be performed. A satisfactory substrate is one that complies with requirements of the Section in which substrate and related Work is specified. Obtain Installer's written report listing conditions detrimental to performance of Work in this Section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Clean substrates of substances harmful to insulation or vapor retarders, including removal of projections that might puncture vapor retarders.

3.3. INSTALLATION

A. General:

1. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with Work.

2. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions. Remove projections that interfere with placement.

3. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

B. General Building Insulation:

1. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

2. Seal joints between closed-cell (non-breathing insulation units) by applying mastic or sealant on edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with mastic or sealant.

3.4. PROTECTION

A. Protect installed insulation and vapor retarders from harmful weather exposures, possible physical abuses, where possible by non-delayed installation of concealing Work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 07 21 16

FIBERGLASS INSULATION

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Batt and Roll Insulation.

1.2. RELATED SECTIONS

A. Section 09 2000 – Plaster and Gypsum Board.

B. Section 07 2113 – Rigid Insulation

1.3. REFERENCES

A. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM C 553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

E. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

F. ASTM C 764 - Standard. Specification for Mineral Fiber. Loose-Fill Thermal Insulation.

G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

H. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

I. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

J. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

K. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

L. Federal Specification HH-I-521F: Insulation Blankets, Thermal (Mineral Fiber, For Ambient Temperatures).

M. Federal Specification HH-I-558B: Insulation, Blocks, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe fitting Covering, Thermal (Mineral Fiber, Industrial Type)

N. National Fire Protection Association (NFPA) Life Safety Code

O. Underwriters Laboratories (UL) - UL 2079 Standard test method for fire resistance of Building Joint Systems.

1.4. SUBMITTALS

A. Submit under provisions of Section 01 3300 – Submittal Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5. QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum of ten years of experience manufacturing products in this section shall provide all products listed.

B. Installer Qualifications: Products listed in this section shall be installed by a single organization with at least five years of experience successfully installing insulation on projects of similar type and scope as specified in this section.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship is approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Storage: Store materials in dry locations with adequate ventilation, free from water, and

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

in such a manner to permit easy access for inspection and handling.

C. Handling: Handle materials to avoid damage.

1.7. SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8. PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Acceptable Manufacturer: CertainTeed Corp., Insulation Group, which is located at: 20 Moores Road; Malvern, PA 19355; Toll Free Tel: 800-233-8990; Email: request info (building.solutions@saint-gobain.com); Web: www.certainteed.com/insulation

B. Or equal. Requests for substitutions will be considered in accordance with provisions of Section 01 6300 – Product Substitution Procedures.

2.2. APPLICATIONS

A. Interior Partitions Indicated with STC Rating: Batt type.

1. Thickness: As indicated on the Drawings.

2.3. BATT AND ROLL INSULATION

A. Acoustical/Thermal Batt Insulation, Certainteed CertaPro Batts. Complies with ASTM C 665; preformed glass fiber batt insulation.

1. Unfaced: ASTM C 665, Type 1.
   a. Fire Hazard Classification: ASTM E 84:
      1) Maximum Flame Spread Index; 5.
      2) Maximum Smoke Developed Index; 5.
   b. Noncombustibility: ASTM E 136, passes.
   c. Sizes:
      1) **Thermal Resistance: R of 8 (RSI 1.4).**
         a) Thickness: 2-1/2 inches (64 mm).
         b) Width: 16 inches (406 mm).
         c) Width: 24 inches (610 mm).

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2) **Thermal Resistance: R of 11 (RSI 1.9).**
   a) Thickness: 3-1/2 inches (89 mm).
   b) Width: 16 inches (406 mm).
   c) Width: 24 inches (610 mm).
3) **Thermal Resistance: R of 19 (RSI 3.4).**
   a) Thickness: 6-1/4 inches (159 mm).
   b) Width: 16 inches (406 mm).

PART 3 - EXECUTION

3.1. EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that all exterior and interior wall, partition, and floor/ceiling assembly construction has been completed to the point where the insulation may correctly be installed.

C. Verify that mechanical and electrical services in ceilings, walls and floors have been installed and tested and, if appropriate, verify that adjacent materials are dry and ready to receive insulation.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2. PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in exterior spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

E. Install insulation with vapor barrier installed facing the warm side. Seal or tape joints as required.

3.4. PROTECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 07 9000

JOINT SEALANTS

PART 1 - GENERAL

1.1. SUMMARY

A. Preparing substrate surfaces to receive joint sealers and joint backing materials.

B. Interior joint sealers and gaskets as indicated on Drawings and specified, including joint backing material and accessories.

C. Exterior joint sealers and gaskets as indicated on Drawings and specified, including joint backing material and accessories.

1.2. RELATED SECTIONS

A. Section 03 3000 – Cast-In-Place Concrete.

B. Section 08 4113 – Aluminum Entrances and Storefronts.

C. Section 09 2116 – Gypsum Board Assemblies.

D. Section 09 3113 – Tile.

1.3. REFERENCES

A. ASTM C834 - Latex Sealing Compounds.

B. ASTM C920 - Elastomeric Joint Sealant.

C. ASTM C1193 - Standard Guide for Use of Joint Sealants.

D. ASTM C1253 - Standard Test Method for Determining the Outgassing Potential of Sealant Backing.

E. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

F. FS TT-S-227 - Sealing Compound, Rubber Base, Two Component.

G. FS TT-S-230 - Sealing Compounds, Synthetic Rubber Base, Single Component, Chemically Cured.

H. FS TT-S-1543 - Sealing Compound, Silicone Rubber Base.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

I. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type.

J. SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

1.5. QUALITY ASSURANCE

A. Installer Qualifications:

1. Acceptable to or licensed by sealant manufacturer.
2. Not less than 3 years experience with systems.
3. Successfully completed not less than 5 comparable scale projects using these systems.
4. Trained in accordance with SWRI Applicator Training Manual.

B. Pre-Construction Compatibility and Adhesion Testing for Structural and Butt Glazed Applications: Submit Samples of materials that will contact or affect joint sealers to joint sealer manufacturers for compatibility and adhesion testing, as indicated below:

1. Testing will not be required when joint sealer manufacturer submits joint preparation data based on previous testing of current joint sealer products for adhesion.

2. Use standard test methods performed by manufacturer to determine if priming and other specific joint preparation techniques are required for adhesion of joint sealers.

a. Perform tests under normal environmental conditions that will exist during actual installation.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 6000 – Product Requirements.

B. Deliver materials to site in original unopened containers of bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and, for multi-component materials, mixing instructions.

C. Store and handle materials per manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.7. PROJECT CONDITIONS

A. Do not proceed with installation of joint sealers under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealer manufacturers.
2. When joint substrates are wet due to rain, frost, condensation, or other causes.

B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than required to achieve performance for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8. WARRANTY

A. Provide manufacturer's written warranty per Section 01 7800 – Closeout Submittals.

B. Special Warranty: Warrant materials and workmanship against defects. Include coverage for installed joint sealer and accessories, which fail to achieve airtight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure, after completion and final acceptance of Work.

1. Repair defects, or replace with new materials, faulty materials or workmanship developed during the guarantee period at no expense to Owner.
2. Acrylic Latex and Butyl Sealant: 1 year warranty.
3. Silicone Sealant and Adhesive: 20 year warranty.
4. Polyurethane Sealant: 5 year warranty.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Joint Sealers: Subject to compliance with requirements, provide products from the manufacturers scheduled. Approved manufacturers are as listed below:

1. BOSTIK Sealant Systems.
2. Dow Corning Silicone Sealant.
3. General Electric Silicone Sealant.
4. PECORA Corporation.
5. SIKA Sealant Systems.
6. SONNEBORN Building Products.
7. TREMCO Sealant Systems.
8. MAMECO International, Inc. - VULKEM.
9. Johns Manville Roof Systems Group.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

10. GAF Material Corporation.

B. Pre-Compressed Foam Gasket: Subject to compliance with requirements, provide products of the manufacturers scheduled:

2.2. MATERIALS

A. General Joint Sealer Performance Requirements:

1. Select materials for compatibility with joint surfaces and other indicated exposures.

2. Except as otherwise indicated select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated.

a. Where exposed to foot traffic, select materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealer system.

3. Provide colors indicated or, if not indicated, to match adjacent paint coloring schemes.

a. Polyurethane sealants shall be available in minimum 30 standard colors.

2.3. ACCESSORIES

A. Joint Cleaner: Non-corrosive and non-staining type, as recommended by joint sealer manufacturer; compatible with joint forming materials.

B. Primer: Non-staining type, recommended by manufacturer to suit application.

C. Joint Backer Rod: Soft, closed cell polyethylene rod designed for use with cold applied joint sealer passing ASTM C1253-93. Provide backer rod of size required for joint design.

D. Joint Filler: ASTM D1056; round, closed cell polyethylene joint filler designed for use with cold applied joint sealer. Provide joint filler of size required for joint design.

E. Bond Breaker: Pressure sensitive tape recommended by joint sealer manufacturer to suit application.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine joints for compliance with requirements for joint configurations, installation tolerances, and substrate condition affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.2. PREPARATION

A. Clean out joints immediately before installing joint sealers to comply with recommendations of joints sealer manufacturers and SWRI Guide.

B. Prime joint substrates where recommended by joint sealer manufacturer and pre-construction joint sealer-substrate tests. Apply primer to comply with joint sealer manufacturer's recommendations.

C. Backer Material:

1. Oversize backer material 25 percent wider than joint to firmly support sealant.

D. Apply release agent or bond breaker strip to joint per SWRI Guide.

3.3. INSTALLATION

A. Comply with SWRI and joint sealer manufacturers' instructions.

B. Elastomeric Sealant Installation: Comply with recommendations of ASTM C962 for use of joint sealer type scheduled.

C. Solvent-Release-Curing Sealant Installation: Comply with requirements of ASTM C804 for use of solvent-release-curing joint sealer.

D. Install joint sealer backings to comply with the following requirements:

1. Install joint-fillers to provide the cross-sectional shapes and depths at working joints.

2. Install bond breaker tape where required or recommended to seal working joints.

E. Install joint sealer completely filling joint, providing uniform, cross-sectional shapes and depths to provide scheduled joint sealer movement capability.

F. Tool joint sealer to form smooth, uniform beads of concave configuration to ensure contact and adhesion of joint sealer with joint.

3.4. PROTECTION

A. Protect exposed to view joint sealers during and after curing period from construction activity.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Section 08 1416 – Flush Wood Doors.
2. Section 08 8100 – Glass and Glazing for glass view panels in hollow metal doors.
3. Section 08 7100 – Door Hardware
4. Section 09 9100 – Paints and Coatings for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3. SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4. QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.6. PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7. COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8. WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Pioneer Industries (PI).
4. Steelcraft (S).

2.2. MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.3. HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Cores of doors shall be as noted on the Door Schedule

C. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.4. HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Frame style and construction shall be as noted on the Door Schedule.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Manufacturers Basis of Design:

    a. Curries Company (CU) – M Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Manufacturers Basis of Design:

    a. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5. FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6. LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

2.7. ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8. FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9. STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3. INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4. ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 08 1416

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. Section Includes:

1. Solid core doors with wood veneer faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.
4. Light frames and glazing installed in wood doors.

B. Related Sections:

1. Section 08 1113 – Hollow Metal Doors and Frames.
2. Section 08 8100 – Glass and Glazing.
3. Section 08 7100 – Door Hardware.

C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI A208.1 – Wood Particleboard.
3. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
4. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
5. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
6. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
7. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.3. SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing specifications.

B. Shop Drawings shall include:

1. Indicate location, size, and hand of each door.
2. Indicate dimensions and locations of mortises and holes for hardware.
3. Indicate dimensions and locations of cutouts.
4. Indicate requirements for veneer matching.
5. Indicate location and extent of hardware blocking.
6. Indicate construction details not covered in Product Data.
7. Indicate doors to be factory finished and finish requirements.
8. Indicate fire protection ratings for fire rated doors.

C. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.
   a. Provide samples for each species of veneer and core material.
   b. Finish veneer faced door samples with same materials proposed for factory finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Provide sample of manufacturer’s warranty.

1.4. QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors’.

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40” above sill) or UL10C.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3rd party certification agency's procedure, except for size.
2. Temperature Rise Limit: Where required and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.
   a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

1.6. PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7. WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
   b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid Core Interior Doors: Life of installation.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 2 - PRODUCTS

2.1. DOOR CONSTRUCTION – GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category B Edge Construction: Provide 20 minute fire rated doors as Category B, with smoke and fire seals (supplied by seal manufacturer) applied to frame for 20 minute openings.

2. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.
b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.

2.2. CORE CONSTRUCTION

A. Particleboard Core Doors:

1. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.
2. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.
3. Blocking: As indicated under article “Blocking”.

2.3. BLOCKING

A. Fire Rated Doors:

1. Provide blocking as indicated below:

a. HB1: 5 inch in doors indicated to have closers and overhead stops.

2.4. VENEERED DOORS FOR TRANSPARENT FINISH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASSA ABLOY Wood Doors (GR): GPD Series.
2. Eggers Industries (EG): Premium Series.
3. Marshfield-Algoma (MF): Signature Series.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Interior Solid Core Doors:

1. Grade: Premium.
2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.
   a. Plain Sliced Birch Veneer, Economy grade faces.
3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces: Running Match.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Transom Match: Continuous match.
7. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
8. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors
9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
10. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.5. LIGHT FRAMES AND GLAZING

A. Wood Beads for Light Openings in Wood Doors up to and including 20-minute rating:

1. Wood Species: Same species as door faces.
2. Profile:
   a. M1 Flush Bead.
   b. At wood core doors with 20-minute fire protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Metal Frames for Light Openings in Fire Rated Doors over 20-minute Rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

1. Manufacturers:

   a. Air Louver (LV).
   b. All Metal Stamping (AP).
   c. Anemostat (AN).
   d. Pemko (PE).

C. Glazing: Comply with installation requirements in Section 08 8100 – Glass and Glazing and with the flush wood door manufacturer's written instructions.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.6. FABRICATION

A. Factory fit doors to suit frame opening sizes indicated.

1. Comply with requirements in NFPA 80 for fire rated doors.
2. Undercut: As required per manufacturer's templates and sill condition.

B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

D. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

2.7. FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.

1. Finish: Meet or exceed WDMA I.S. 1A TR8 UV Cured Acrylated Polyester finish performance requirements.
2. Staining: Custom stain to match architect's sample.
3. Sheen: Satin.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Hardware: For installation, see Section 08 7100 – Door Hardware.

B. Installation Instructions: Install doors and frames to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

E. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.

3.3. ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 08 3100

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1. SUMMARY

A. Access panels including frames, hardware, and attachments, for wall and ceiling locations.

B. Flush access doors with exposed flanges.

1.2. RELATED SECTIONS

A. Section 08 3113 – Access Panel and Frames: Attic access door.

B. Section 09 2116 – Gypsum Board Assemblies.

C. Section 09 9100 – Paintings and Coatings.

1.3. SYSTEM DESCRIPTION

A. Coordination Requirements:

1. Identify locations and sizes for required access doors and frames and indicate on submittal schedule. Access panels to access concealed equipment, controls, valves and switches are required whether or not shown, or indicated.

1.4. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Shop Drawings:

1. Door and panel units: Show types, elevations, thickness of metals, full size profiles of door members.
2. Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.
3. General: Show connections of units and hardware to other Work.
4. Include schedules showing location of each type and size of door and panel units.

C. Product Data: Manufacturer's technical data for each type of access door and panel assembly, including setting drawings, templates, fire-resistive characteristics, finish requirements, and details of anchorage devices.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Include complete schedule; types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.

D. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

1.5. QUALITY ASSURANCE

A. Single Source Responsibility: Obtain access door and panel units, and frames for entire Project from one source and one single manufacturer.

B. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door and panel assemblies with panel door, frame, hinge, and latch from manufacturer listed in Underwriter's Laboratories (UL), "Building Materials Directory" for rating shown.

1. Provide UL label on each fire-rated access door assembly.
2. Provide 45 minute UL label at 1-hour rated partitions unless indicated otherwise.
3. Provide 90 minute UL label at 2-hour rated partitions unless indicated otherwise.

C. Size Variations: Obtain Architect's acceptance and approval of manufacturer's standard size units that may vary slightly from sizes indicated on Drawings.

D. Coordination: Provide inserts and anchoring devices that will be built into other Work for installation of access door assemblies. Coordinate delivery with other Work to avoid delay.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Subject to compliance with requirements, provide products from 1 of the following manufacturers:

1. Acudor
2. Nystrom, Inc.
3. Access Panel Solutions Inc.
4. CESCO Products, Inc.
5. J.L. Industries, Inc.
6. Karp Associates, Inc.
7. Milcor, Inc.

B. Substitutions: Comply with Section 01 6000 – Product Requirements.

2.2. WALL AND CEILING PANELS

A. Refer to Access Door Schedule for products required of this Section.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.3. FABRICATION

A. Each access panel shall be fabricated as a complete unit, ready for installation, shipped with all parts, fasteners, and accessories required for a complete installation.

B. All welds shall be continuous and ground smooth and flush with surface.

C. Exposed flanges shall be integral with the frame and all corners welded and ground smooth.

D. For installation in masonry, supply frames with adjustable steel anchors.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that rough openings for door and frame are correctly sized and located.

C. Verify mechanical and electrical requirements for ceiling or wall access panels.

D. The Contractor shall coordinate the work of this section and all related sections.

E. Prior to installation of finish wall surfaces, ensure that all blocking and structure is in place and satisfactory for access panel installation.

F. Ensure that there is adequate clearance for operation of access panel and access to equipment for maintenance.

G. Ensure that access panel is large enough to allow proper access to equipment.

3.2. INSTALLATION

A. Install frames plumb and level in opening. Secure rigidly in place.

B. Position units to provide convenient access to concealed Work.

C. Access panels are to be installed per the manufacturer's instructions, Drawings, and final reviewed shop drawings.

D. Provide all drilling, cutting and patching as required for a complete installation.

E. Ensure that access panels required to be fire rated are installed per manufacturer's instructions. Do not modify any panels that have UL or other listings.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.3. CLEAN AND ADJUST

A. Clean adjacent surfaces and remove unused product and debris from site.

B. Adjust doors for smooth operation.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 08 41 13

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.1. SUMMARY

A. Related Documents: Conditions of the Contract, Division 1 – General Requirements, and Drawings apply to Work of this Section.

B. Section Includes:

1. Storefront framing, complete with reinforcing, fasteners, anchors, and attachment devices.
2. Storefront doors, complete with reinforcing for hardware requirements.
3. Accessories necessary to complete the work.

C. Related Sections:

1. Section 01 4000 – Quality Requirements
2. Section 05 5000 – Metal Fabrications
3. Section 07 9000 – Joint Sealants
4. Section 08 5213 – Aluminum Clad Windows
5. Section 08 7100 – Door Hardware
6. Section 08 8100 – Glass Glazing

1.2. REFERENCES

A. Aluminum Association (AA):

1. DAF-45 Designation System for Aluminum Finishes.

B. American Architectural Manufactures Association (AAMA):

1. 501 Methods of Test for Exterior Walls.
2. 501.2 Quality Assurance and Diagnostic Water Leakage Field Check of installed Storefront, Curtain Walls, and Sloped Glazing Systems.
3. 611 Voluntary Specification for Anodized Architectural Aluminum
4. 701 Voluntary Specifications for Pile Weather-stripping and Replaceable Fenestration Weather seals.
5. 1503 Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
6. CW-10 Care and handling of Architectural Aluminum from Shop to Site.
7. SFM-1 Aluminum Storefront and Entrance Manual.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. American Society for Testing and Materials (ASTM)

1. B209 Aluminum and Aluminum – Alloy Sheet and Plate
2. B221 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
3. E283 Test Method for Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.
4. E330 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
5. E331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

D. Glass Association of North America (GANA):

1. Glazing Manual.

1.3. SYSTEM REQUIREMENTS

A. Design Requirements

1. Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this project. Failure includes the following:
   a. Air infiltration and water penetration exceeding specified limits.
   b. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
2. Drawings are diagrammatic and do not purport to identity nor solve problems of thermal of structural movement, glazing, anchorage, or moisture disposal.
3. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.
4. Provide concealed fastening whenever possible.
5. Provide entrance and storefront systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.
6. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening, or fracturing connection between units and building structure or between units themselves.
7. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
8. Provide for expansion and contraction due to structural movement without detriment to appearance or performance.
9. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 degrees F without causing buckling, stress on glass, failure of
10. joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Performance Requirements:

1. Wind loads: provide framing systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
2. Air infiltration: Air leakage through fixed light areas of storefront shall not exceed 0.06 cfm per square foot of surface area when tested in accordance with ASTM E283 at differential static pressure of 6.24 psf.
3. Water infiltration: No uncontrolled leakage when tested in accordance with ASTM E331 at test pressure of 8 psf as defined in AAMA 501.
4. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E330.
5. Seismic Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Building and Other Structures," and "Earthquake Loads," whichever are more stringent.

6. Dead Loads: Provide entrance and storefront system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.

    a. Provide a minimum 1/8 inch clearance between members and top of glazing or other fixed part immediately below.
    b. Provide a minimum 1/16 inch clearance between members and doors.

7. Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall when subjected to specified design pressures for spans up to and including 13'-6" shall be limited to [1/175] of its clear span and for spans greater than 13'-6" deflection shall be limited to [1/240] of its clear span + 1/4", except that maximum deflection of members supporting plaster surfaces shall not exceed 1/360 of its span.
8. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.63 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.
9. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 45.

C. Testing Requirements: provide components that have been previously tested by an independent testing laboratory.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.4. SUBMITTALS

A. General: Submit in accordance with Section 01 3300 – Submittal Procedures.

B. Product Data:

1. Submit manufacturer's descriptive literature and product specifications.
2. Include information for factory finishes, hardware, accessories, and other required components.
3. Include color charts for finish indicating manufacturer's standard colors available for selection.

C. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
2. Product Data for Credit EQ 4.1: For adhesives and sealants used inside the weatherproofing system, including printed statement of VOC content.

D. Shop Drawings:

1. Submit shop drawings covering fabrication, installation and finish of specified systems.

2. Include following:

a. Fully dimensioned elevation drawing with details coordination keys.
b. Locations of exposed fasteners and joints.

3. Provide detailed drawings of:

a. Composite members.
b. Joint connections for framing systems and for entrance doors.
c. Anchorage.
d. System reinforcements
e. System expansion and contraction provisions.
f. Glazing methods and accessories.
g. Internal sealant requirements.
h. Thermal improvements.

4. Schedule of finishes

E. Samples:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Submit manufacturer's standard samples indicating quality of finish.
2. Where normal texture or color variations are expected, include additional samples illustrating
3. range of variation.

F. Test Reports:

1. Standard systems: Submit certified copies of previous test reports substantiating performance of system in lieu of retesting. Include other supportive data as necessary.

G. Qualification Data:

1. Submit certification from storefront manufacturer verifying installer's qualifications, and verifying that installer has the required five years minimum experience installing aluminum-framed entrance and storefront systems.

H. Manufacturer's instructions: Submit manufacturer's printed installation instructions.

I. Sealant Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating that the materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include joint sealant manufacturer's written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion

1.5. QUALITY ASSURANCE

A. Single Source Responsibility:

1. To ensure quality of appearance and performance, obtain materials for systems from either a single manufacturer or from manufacturer approved by systems manufacturer.

B. Installer Qualifications: Certified in writing by system manufacturer as qualified for installation of specified systems.

1. Engineering Responsibility: Installer shall assume engineering responsibility and shall prepare data for entrance and storefront systems, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project.

C. Perform work in accordance with AAMA SFM-1 and manufacturer's written instructions.

D. Manufacturer's representatives shall inspect final installation and provide a written report of acceptance to be included with storefront installer's closeout documents.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Sections 01 6000 – Product Requirements.

B. Protect finished surfaces as necessary to prevent damage.

C. Do not use adhesive papers or sprayed coatings that become firmly bonded when exposed to sun.

D. Do not leave coating residue on any surfaces.

E. Replace damaged units.

1.7. WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract.

B. Provide written warranties in form acceptable to Owner signed by manufacturer, installer and General Contractor, as follows:

1. Manufacturer's Warranty shall cover the following:

    a. Structural failures including, but not limited to, excessive deflection.
    b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    c. Defective materials, defective manufacture, or glass breakage due to defective design.
    d. Failure of operating components to function normally.
    e. Agreement to replace components which fail within 2 years from date of Substantial Completion.

2. Installer's Warranty shall cover the following:

    a. All items listed above under Manufacturer's Warranty.
    b. Water leakage through fixed glazing and frame areas.
    c. Defective installation workmanship, or glass breakage due to defective installation.

3. General Contractor's Warranty shall cover the following:

    a. Items a) through d) listed above under Manufacturer' Warranty.
    b. Items a) through c) listed above under Installer's Warranty.
    c. Agreement to provide materials and labor for replacement of defective components that fail within 2 years from date of Substantial Completion.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Warranty response time: The aluminum storefront installer shall respond to requests for warranty repairs within 24 hours of receiving notice that such repairs are required.

PART 2 – PRODUCTS

2.1. MANUFACTURERS AND PRODUCTS

A. Subject to compliance with requirements indicated, provide products by one of the following:

1. Oldcastle Building Envelope.
2. Kawneer Company.
3. Tubelite, Inc.
4. Arcadia

B. Or Equal.

C. Acceptable storefront framing system for exterior use: (2”x 4 ½” center glazed storefront):

1. Oldcastle Series 3000 Thermal Multiplane.
2. Kawneer VG451T.
3. Tubelite T14000
4. Storefront framing system must be conventionally center glazed. Offset, or structural, glazing systems are not acceptable.

D. Acceptable storefront framing system for interior use: (1-3/4”x 4-1/2” center glazed storefront) (Interior storefront doors and framing systems shall have the same gauge aluminum and same structural construction as the exterior systems.):

1. Oldcastle Series 2000 framing.
2. Kawneer Trifab 450.
3. Tubelite E4500 series.

E. Acceptable entrance door systems:

1. Door construction: 2 inch overall thickness with minimum .188 inch thick extruded aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

2. Door design: Shall be Wide Stile (6”) with smooth surface, minimum 10” high, bottom rails. Door top rail to be a minimum of 6” high for closer mounting. Door height to be no taller than 7’-0”.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3. Door labeling: Doors shall have permanent labels on the hinge edge surface identifying the door manufacturer.

4. Glazing stops and gaskets: Shall be snap-on, extruded aluminum stops and preformed gaskets. Provide non-removable glass stop to exterior of door.

5. Door stops: Shall be integral to the door frame extrusion. Door stop must be a minimum of ½" high x 1" deep. Fin type, snap in, or screw applied door stops are not acceptable. Door stops must provide uninterrupted weathering the entire length of the stop.

6. Reinforcing and Anchoring: Doors and door frames are to be properly reinforced with 1/4" min. thickness internal steel back up material sufficient for attaching hardware as specified. In addition to steel reinforcing, door frame extrusion is to be non-thermally broken with 3/16" minimum wall thickness for hardware mounting with integral door stops as part of the extrusion. Types of hardware include, but are not limited to: surface mounted door closers, handicap operators, hold open arms, lock or latch strikes, removable mullions, hinges or pivots, and any other hardware as called out in the finish hardware section of the specifications. Hardware must be anchored to the main sections of the storefront door or door frame and no hardware will be anchored into any snap-on extrusion.

7. Hardware reinforcement for hinging to run continuous the full length of the door jamb. Hardware reinforcement for lock strikes and closers to be a minimum of 16" in length and located within the door and frame to accommodate the specified hardware.

8. Door frames: Only aluminum, wood, or fiberglass doors are to be installed in aluminum door frames. Do not install hollow metal doors in aluminum door frames.

9. Door frame and reinforcement requirements, described above, apply to both interior and exterior aluminum door frames. Door frames must be able to accommodate doors that are 1-3/4" or 2" thick as called for on the drawings, or in the specifications.

2.2. FRAMING MATERIALS AND ACCESSORIES

A. Aluminum:

1. ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H16 for sheets; or other alloys and temper recommend by manufacturer appropriate for specified finish.
2. Internal Reinforcing:
3. ASTM A36 for carbon steel.
4. Shapes and sizes to suit installation.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

5. Steel components factory coated with alkyd type zinc chromate primer complying with FS TT-P-645.

B. Anchorage Devices:

1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.
2. Hot-dip galvanized steel assemblies after fabrication; comply with ASTM A123, 2.0 ounce minimum coating.

C. Fasteners:

1. Aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with items being fastened.
2. Provide concealed fasteners wherever possible.
3. For exposed locations, provide Phillips flathead screws with finish matching item fastened.
4. For concealed locations, provide manufacturer's standard fasteners.

D. Expansion Anchor Devices: lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

E. Protective Coatings: Cold-applied asphalt mastic complying with SSPC, compounded for 30 mil thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645

F. Touch-Up primer for galvanized components: zinc oxide conforming with FS TT-P-641

G. Glazing Gaskets:

1. Compression type design, replaceable, molded or extruded, of neoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).
2. Profile and hardness as required to maintain uniform pressure for watertight seal.

H. Weatherproofing:

1. Wool pile conforming to AAMA 701.2.

I. Internal Sealants and Baffles.

J. Adhesives and Sealants: Provide adhesives and sealants inside the weatherproofing system containing VOC content of 250g/L, or less when calculated according to 40CFR 59, Subpart D (EPA Method 24).

2.3. GLASS AND GLAZING

A. Refer to Section 08 8100 – Glass Glazing.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.4. FABRICATION

A. Coordination of Fabrication

1. Check actual frame or door openings required in construction work by accurate field measurements before fabrications.
2. Fabricate units to withstand loads that will be applied when system is in place.

B. General

1. Conceal fasteners wherever possible.
2. Reinforce work as necessary for performance requirements, and for support to structure.
3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or preformed separators, which will prevent contact and corrosion.
4. Comply with Section 08 8100 – Glass Glazing, for glazing requirements.

C. Aluminum Framing

1. Provide members of size, shape and profile indicated, designed to provide for glazing from the exterior at the first level or ground floor level. Glaze system from the interior at any locations above the first level.
2. Provide manufacturer's standard thermal break between exterior and interior aluminum surfaces.
3. Fabricate frame assemblies with joints straight and tight fitting. Doors and door frames are to be shop fabricated. Field fabrication of frames will not be allowed.
4. Reinforce internally with structural members as necessary to support design loads.
5. Maintain accurate relation of planes and angles, with hairline fit of contacting members.
6. Seal horizontals and direct moisture accumulation to exterior.
7. Provide flashings and other materials used internally or externally that are corrosive resistant, not-straining, non-bleeding and compatible with adjoining materials.
8. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without detrimental to appearance or performance.
9. Provide storefront manufacturer's standard high performance extruded sill flashing at all storefront framing.
10. Fabricate door frames to accept specified hardware without compromising the weather seal around doors.

D. Welding

1. Comply with recommendations of the American Welding Society.
2. Use recommended electrodes and method to avoid distortion and discoloration.
3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

E. Flashings: Form from sheet aluminum with same finish as extruded sections, unless otherwise noted. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning".

2.5. FINISHES

A. Color/: Dark Bronze

1. Conforming to AAMA 601, and either AA-M12C22A44 or AAM10C21A44.
2. Architectural Class [1], etched, medium matte, [dark bronze] colored anodic coating, [0.7] mil minimum thickness.

PART 3 – EXECUTION

3.1. EXAMINATION

A. Examine conditions and proceed with Work in accordance with Section 01 4000 – Quality Requirements.

3.2. INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.

B. Erection Tolerances:

1. Limit variations from plumb and level:

   a. 1/8 inch in 10'-0" vertically.
   b. 1/8 inch in 20'-0" horizontally.

2. Limit variations from theoretical locations; 1/4 inch for any member at any location.
3. Limit offsets in theoretical end-to-end and edge-to-edge alignment: 1/16 inch from flush surfaces not more than 2 inches apart or out-of-flush by more than 1/4 inch.

C. Install doors and hardware in accordance with manufacturer's printed instructions.

D. Set units plum, level and true to line, without warp or rack of frame.

E. Anchor securely in place, allowing for required movement, including expansion and contraction.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

F. Separate dissimilar materials at contact points, including metal in contact with masonry or concrete surfaces, with bituminous paint or preformed separators to prevent contact with masonry of concrete.

G. Set sill members in bed of sealant. Set other members with internal sealants and baffles to provide weather-tight construction.

H. Coordinate installation of perimeter sealant and backing materials between assemblies and adjacent construction in accordance with requirements of Section 07 9000 – Joint Sealants.

I. Glazing: refer to requirements of Section 08 8100 – Glass Glazing.

3.3. ADJUSTING

A. Test door operating function. Adjust closing and latching speeds and other hardware in accordance with manufacturer's instructions to ensure smooth operation.

3.4. CLEANING

A. Clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.

B. Clean metal surfaces exercising care to avoid damage.

3.5. PROTECTION

A. Provide final protection and maintain conditions, acceptable to manufacturer and installer, that ensure entrance and storefront systems are without damage or deterioration at Substantial Completion.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
4. Division 28 Section “Access Control”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as

applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.

   b. Manufacturer of each item.

   c. Fastenings and other pertinent information.

   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.

   e. Explanation of abbreviations, symbols, and codes contained in schedule.

   f. Mounting locations for door hardware.

   g. Door and frame sizes and materials.

   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of

other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

b. Complete (risers, point-to-point) access control system block wiring diagrams.

c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this

Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through the Norton Preferred Installer (NPI) program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

G. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and

physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

J. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace

components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Seven years for heavy duty cylindrical (bored) locks and latches.
3. Five years for exit hardware.
4. Twenty five years for manual overhead door closer bodies.
5. Five years for motorized electric latch retraction exit devices.
6. Two years for electromechanical door hardware, unless noted otherwise.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1. Permanent cylinders, cores, and keys to be installed by Owner.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.

b. Three Hinges: For doors with heights 61 to 90 inches.

c. Four Hinges: For doors with heights 91 to 120 inches.

d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.

b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.

b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

a. McKinney (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared

hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:

    a. Pemko (PE).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

    a. Pemko (PE) - SER-QC (# wires) Option.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

    a. McKinney (MK) - Electrical Connecting Kit: QC-R001.

    b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

    a. McKinney (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

A. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with

beveled edges, secured with exposed screws unless otherwise indicated.

2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
5. Manufacturers:
    a. Rockwood (RO).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Key Quantity: Provide the following minimum number of keys:

1. Construction Keys (where required): Ten (10).
2. Construction Control Keys (where required): Two (2).

C. Construction Keying: Provide construction master keyed cylinders.

D. Construction Keying: Provide temporary keyed construction cores.

E. Key Registration List (Bitting List):

1. Furnish a list of opening numbers with locking devices, showing cylinder types and quantities required when cylinders or cores are to be owner furnished.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to 14 million cycles or greater.

2. Where specified, provide status indicators with highly reflective color and wording for “locked/unlocked” or “vacant/occupied” with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1” x 0.6” with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.

3. Manufacturers:

    a. Sargent Manufacturing (SA) - 8200 Series.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.

1. Locks shall meet or exceed the requirements of ANSI/BHMA A156.2 Series 4000, Grade 1 with all standard trims, as follows:

    a. Cycle Test: ANSI/BHMA A156.2 Grade 1 requirements with no lever sag.

    b. Abusive Locked Lever Torque: Exceed 3,100 in-lb with no entry; lock to maintain egress functionality in compliance with BHMA certification requirements.

    c. Offset Lever Pull: Exceed 1,600 lbs with no entry (8 times ANSI/BHMA A156.2 requirements).

    d. Latch Retraction with Preload: Exceed 100 lb preload while maintaining ANSI/BHMA requirements for operation in warped doors (2 times ANSI/BHMA A156.2 requirements).

2. Vertical Impact: Exceed 100 vertical impacts (20 times ANSI/BHMA A156.2 requirements).

3. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

4. Locks are to be non-handed and fully field reversible.

5. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 12 million cycles.

6. Manufacturers:

    a. Sargent Manufacturing (SA) - 10X Line.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.

6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.

   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Extended cycle test: Devices to have been cycle tested 50 million cycles.

11. Rail Sizing: Provide exit device rails factory sized for proper door width application.

12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 80 Series.

C. Extruded Aluminum Removable Mullions: ANSI/BHMA A156.3 anodized, removable mullions with malleable-iron top and bottom retainers. Mullions to be provided standard with stabilizers and imbedded weatherstrip.

1. Manufacturers:

a. Same as exit device manufacturer.

D. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

1. Provide keyed removable feature where specified in the Hardware Sets.

2. Provide stabilizers and mounting brackets as required.

3. Provide electrical quick connection wiring options as specified in the hardware sets.

4. Manufacturers:

a. Same as exit device manufacturer.

2.9 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.

3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

4. Manufacturers:

   a. Sargent Manufacturing (SA) - 80 Series.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves

for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:

    a. Norton Rixson (NO) - 7500 Series.

C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

    a. Norton Rixson (NO) - Unitrol Series.

2.11 ELECTROMECHANICAL DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:
1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Wireless Interface: Operator units shall have a wireless interface via a mobile device for ease of installation and setup.

J. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Norton Rixson (NO) - 6300 Series.
2. Ditec Entrematic (DI) - HA-9 Series

2.12 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

a. Rockwood (RO).

2.13 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall

bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Rockwood (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

    a. Norton Rixson (RF).

2.14 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2.15 ELECTRONIC ACCESSORIES

A. Touchless Switches: FCC certified microwave sensing switch used for REX or activation of various access control devices in place of a traditional wired switch. Unit to have an adjustable sensing zone from 4” to 24”. At exterior locations furnish foam gaskets and weather covers. Provide single gang or double gang unit as specified in the hardware sets.

1. Manufacturers:

a. Norton Rixson (NO) - 700 Series.

b. Securitron (SU) - WSS Series.

2.16 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.17 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Power Operator products and accessories are required to be installed through current members of the manufacturer's "Power Operator Preferred Installer" program.

D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”.

Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SA - SARGENT
4. MC - Medeco
5. RO - Rockwood
6. NO - Norton
7. OT - Other
8. SU - Securitron

Hardware Sets

Set: 1.0

Doors: 125

2	Elec Continuous Hinge	CFM_SLF-HD1 SER		PE
1	Removable Mullion	L980A	US28	SA
1	Elec Rim Exit, Storeroom	LC 43 55 56 AD8504 862	US32D	SA
1	Elec Rim Exit, Dummy	43 55 56 AD8510 862	US32D	SA
1	Cylinder/Core	Provided by Owner	26	MC
2	Surface Closer	7500	689	NO
2	Floor Stop (Exterior)	466-RKW	Black	RO
1	Threshold	171A		PE
1	Gasketing	By Aluminum Frame Supplier		OT
2	Sweep	315CN		PE
2	Frame Wiring Harness	QC-C1500P		MK
2	Door Wiring Harness	QC-Cxxx		MK
2	Door Position Switch	By Security Integrator		OT
1	Card Reader	By Security Integrator		OT
1	Power Supply	By Security Integrator		OT

Notes: Operation Description:
Door normally closed, latched, and locked.
Presenting valid credential or key override to unlock. Exit device latch can be electrically held retracted

for open access.
Exit device latch releases and locked in event of power loss
Free to egress at all times.

Set: 1.1

Doors: 111

2	Elec Continuous Hinge	CFM_SLF-HD1 SER		PE
1	Removable Mullion	L980A	US28	SA
1	Elec Rim Exit, Storeroom	LC 43 55 56 AD8504 862	US32D	SA
1	Elec Rim Exit, Dummy	43 55 56 AD8510 862	US32D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Automatic Opener	D6000 Series	689	NO
2	Floor Stop (Exterior)	466-RKW	Black	RO
1	Threshold	171A		PE
1	Gasketing	By Aluminum Frame Supplier		OT
2	Sweep	315CN		PE
2	Frame Wiring Harness	QC-C1500P		MK
2	Door Wiring Harness	QC-Cxxx		MK
2	Door Position Switch	By Security Integrator		OT
2	Operator Actuator (Hands Free)	WSS-WSD		SU
1	Card Reader	By Security Integrator		OT
1	Power Supply	By Security Integrator		OT

Notes: All wiring, conduit, low voltage, wiring diagrams, and security by Div. 28
Auto Operator order of operations:
During normal business hours, panic device latch is electronically dogged allowing ingress without the use of key. Activation of wall-plate actuator from the outside will automatically open active leaf for ingress without needing to pull the door open manually. Egress always allowed via pushing door open or wall-plate actuator activation from inside the opening.
During off hours, doors are closed and locked. Ingress available by presenting proper credentials, or by mechanical key override.

Set: 2.0

Doors: 121

2	Elec Continuous Hinge	CFM_SLF-HD1 SER		PE
1	Removable Mullion	L980A	US28	SA
1	Elec Rim Exit, Storeroom	LC 43 55 56 AD8504 862	US32D	SA
1	Elec Rim Exit, Dummy	43 55 56 AD8510 862	US32D	SA

2	Cylinder/Core	Provided by Owner	26	MC
1	Surface Closer	7500	689	NO
1	Surface Closer	UNIJ7500	689	NO
1	Floor Stop (Exterior)	466-RKW	Black	RO
1	Threshold	171A		PE
1	Gasketing	By Aluminum Frame Supplier		OT
2	Sweep	315CN		PE
2	Frame Wiring Harness	QC-C1500P		MK
2	Door Wiring Harness	QC-Cxxx		MK
2	Door Position Switch	By Security Integrator		OT
1	Card Reader	By Security Integrator		OT
1	Power Supply	By Security Integrator		OT

Notes: Operation Description:
Door normally closed, latched, and locked.
Presenting valid credential or key override to unlock. Exit device latch can be electrically held retracted for open access.
Exit device latch releases and locked in event of power loss
Free to egress at all times.

Set: 3.0

Doors: 101

1	Elec Continuous Hinge	CFM_SLF-HD1 SER		PE
1	Elec Rim Exit, Storeroom	LC 43 55 56 AD8504 862	US32D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Automatic Opener	6300 Series	689	NO
1	Threshold	171A		PE
1	Gasketing	By Aluminum Frame Supplier		OT
1	Sweep	315CN		PE
1	Frame Wiring Harness	QC-C1500P		MK
1	Door Wiring Harness	QC-Cxxx		MK
1	Door Position Switch	By Security Integrator		OT
2	Operator Actuator (Hands Free)	WSS-WSD		SU
1	Card Reader	By Security Integrator		OT
1	Power Supply	By Security Integrator		OT

Notes: Operation Description:
Door normally closed, latched, and locked.
Presenting valid credential or key override to unlock. Exit device latch can be electrically held retracted for open access.

ADA access by actuator switch. In locked condition, actuator energized only upon valid card reader presentation
Exit device latch releases and locked in event of power loss
Free to egress at all times. ADA egress by actuator switch

Set: 4.0

Doors: 117

1	Elec Continuous Hinge	CFM_SLF-HD1 SER		PE
1	Elec Rim Exit, Exit Only	43 55 AD8510 EO	US32D	SA
1	Surface Closer	UNIJ7500	689	NO
1	Drop Plate	7786	689	NO
1	Threshold	171A		PE
1	Gasketing	By Aluminum Frame Supplier		OT
1	Sweep	315CN		PE
1	Frame Wiring Harness	QC-C1500P		MK
1	Door Wiring Harness	QC-Cxxx		MK
1	Door Position Switch	By Security Integrator		OT

Notes: Exit Only. Door and push bar status monitored.

Set: 5.0

Doors: 104a, 104b

3	Hinge, Hvy Wt	T4A3786 (NRP/Size as req.)	US26D	MK
1	Rim Exit Device, Classroom	LC 43 8813 ETP	US32D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Surface Closer	7500	689	NO
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Wall Stop	406/409	US32D	RO
1	Gasketing	S88D		PE

Set: 6.0

Doors: 108, 114, 120, 123, 124a, 207, 209, 220, 228, 230, 231, 248

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Storeroom Lock	LC 10XG04 LP	US26D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Surface Closer	7500	689	NO
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO

1	Wall Stop	406/409	US32D	RO
3	Silencer	608-RKW		RO

Set: 6.1

Doors: 113

6	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Flush Bolt (Comb Wd)	2945	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	LC 10XG04 LP	US26D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Coordinator	2600	Black	RO
2	Mounting Bracket	2601AB/C (As Required)	Black	RO
2	Surface Closer	P7500	689	NO
2	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
2	Wall Stop	406/409	US32D	RO
2	Silencer	608-RKW		RO

Set: 6.2

Doors: 116

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Storeroom Lock	LC 10XG04 LP	US26D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Surface Closer	P7500	689	NO
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Wall Stop	406/409	US32D	RO
3	Silencer	608-RKW		RO

Set: 7.0

Doors: 105

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Storeroom Lock	LC 10XG04 LP	US26D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Surface Closer	CLP7500	689	NO
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Gasketing	By Aluminum Frame Supplier		OT

Set: 8.0

Doors: 109, 128, 129, 204, 205, 206, 212, 213, 214, 215, 218, 219, 221, 222, 223, 224, 225, 226, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 246, 247

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Office Lock	LC 10XG05 LP	US26D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Wall Stop	406/409	US32D	RO
1	Gasketing	By Aluminum Frame Supplier		OT

Set: 9.0

Doors: 203, 210, 217

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Office Lock	LC 10XG05 LP	US26D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Surface Closer	7500	689	NO
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Wall Stop	406/409	US32D	RO
1	Gasketing	By Aluminum Frame Supplier		OT

Set: 10.0

Doors: 211

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Classroom Lock	LC 10XG37 LP	US26D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Wall Stop	406/409	US32D	RO
1	Gasketing	By Aluminum Frame Supplier		OT

Set: 11.0

Doors: 119, 130, 131, 202, 208

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Classroom Lock	LC 10XG37 LP	US26D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Surface Closer	7500	689	NO
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Wall Stop	406/409	US32D	RO
1	Gasketing	By Aluminum Frame Supplier		OT

Set: 12.0

Doors: 112

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Classroom Lock	LC 10XG37 LP	US26D	SA
1	Cylinder/Core	Provided by Owner	26	MC
1	Surface Closer	P7500	689	NO
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Wall Stop	406/409	US32D	RO
1	Gasketing	By Aluminum Frame Supplier		OT

Notes: Parallel mount closer.

Set: 13.0

Doors: 106, 107, 227

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Privacy Lock w/ Indicator	V21 8265 LNP	US26D	SA
1	Surface Closer	7500	689	NO
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Wall Stop	406/409	US32D	RO
1	Gasketing	S88D		PE

Set: 14.0

Doors: 126, 127, 233, 234

3	Hinge	TA2714 (NRP/Size as req.)	US26D	MK
1	Push Plate	70F	US32D	RO
1	Pull Plate	111x70C	US32D	RO
1	Surface Closer	7500	689	NO
1	Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1	Wall Stop	406/409	US32D	RO
1	Gasketing	S88D		PE

END OF SECTION 087100

SECTION 087113 - AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Low energy automatic door operators for swinging doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 01 Section "Cash Allowances".
3. Division 01 Section "Product Allowances".
4. Division 01 Section "Closeout Procedures".
5. Division 08 Section “Door Schedule”.
6. Division 08 Section “Hollow Metal Doors and Frames”.
7. Division 08 Section “Flush Wood Doors”.
8. Division 08 Section “Door Hardware”.
9. Division 08 Section “Access Control Hardware”.
10. Division 26 Section “Electrical”.

A. Codes and Standards: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI/BHMA A156.4 - Door Controls, Door Closers.
3. ANSI/BHMA A156.19 - Power Assist and Low-Energy Power Operated Doors.
4. ICC/IBC - International Building Code.
5. NFPA 70 - National Electrical Code.
6. NFPA 80 - Fire Doors and Windows.
7. NFPA 101 - Life Safety Code.
8. NFPA 105 - Installation of Smoke Door Assemblies.
9. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
10. UL 325 - Door, Drapery, Gate, Louver, and Window Operators and Systems.
11. State Building Codes, Local Amendments.

1.3 PERFORMANCE REQUIREMENTS

A. Automatic door operators to be used on interior or exterior doors; up to 200 pounds (91 kg) weight and maximum door width of 48" (1219 mm).

1. Auto door operator capable of operating within temperature ranges of -22°F (-30°C) and 122°F (50°C).

1.4 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators, including activation devices. Include operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: Include details and attachments to other work.

1. Include locations and elevations of each unique entrance showing activation devices.
2. Indicate required clearances, components, and location and size of field connections.
3. Wiring Diagrams: For power, signal, and activation wiring.

C. Qualification Data: Provide copy of manufacturer's official certification or accreditation document indicating proof of status as a qualified and authorized installer of automatic door operators and accessories.

D. Operating and Maintenance Manuals: Provide manufacturer's operating and maintenance manual for each item comprising the automatic door operator installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturer and Installer providing the operators and installation. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

E. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.

B. Certified Installer Qualifications: Power operator products and accessories are required to be supplied and installed through the Norton Preferred Installer (NPI) program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

C. Source Limitations: Obtain automatic door operators, including activation devices, from single source, qualified supplier unless otherwise indicated.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

E. Exit Door Requirements: Comply with requirements of authorities having jurisdiction for doors with automatic door operators serving as a component of a required means of egress.

F. Fire Rated Door Assemblies: Provide operators for fire rated door assemblies that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for use on types and sizes of labeled fire doors required.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and the procedures for receiving, handling, and installing automatic door operators.

1. Prior to installation of automatic door operators, arrange for certified Installer's representative to conduct a project specific meeting to review the installation and maintenance of their respective products. Project meeting to be attended by representatives of related trades furnishing and installing the aluminum, hollow metal and wood doors sections.
2. Review and finalize construction schedule and verify availability of materials.

1.6 COORDINATION

A. Electrical Systems Coordination: Coordinate the layout and installation of scheduled automatic door operators and related activation devices, with required connections to source power junction boxes, remote power supplies, access control equipment, detection and monitoring hardware, and fire alarm system.

B. Templates: Obtain and distribute to the parties involved, templates for doors, frames, operators, and other work specified to be factory prepared and reinforced for installing automatic door operators. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.

C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified automatic door operators without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer, agreeing to repair or replace components of automatic door operators that fail in materials or workmanship within specified

warranty period after final acceptance by Owner. Failures include, but are not limited to, the following:

1. Faulty or sporadic operation of automatic door operator, including activation and safety devices.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.

C. Special Warranty Period: Two years from date of Substantial Completion.

D. Provide extended warranty from defects in material or workmanship under normal use for a period of 3 years from the date of substantial completion for units installed by a certified ASSA ABLOY Power Operator Preferred Installer in accordance with the manufacturer's written warranty certificate.

1.8 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance by skilled employees of automatic door operator Installer. Include planned and preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

B. Extended Maintenance Support and Service Agreement: Submit for Owner’s consideration an optional extended Service Agreement for the installed automatic door operator system. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.

1. A published copy of this agreement to be included with the submittal package
2. Support for the installed automatic door operator system is provided through the vendor under a specified, limited 24 hour support program.
3. Automatic door operators and components are to be available on a one-day turn around time frame from the vendor.

PART 2 - PRODUCTS

2.1 ELECTROMECHANICAL DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Norton Door Controls (NO) - 6300 Series.

2.2 ELECTROHYDRAULIC DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Norton Door Controls (NO) - 6000 Series.

2.3 ACTIVATION DEVICES

A. General: Provide activation devices in accordance with ANSI/BHMA A156.19 standard, for condition of exposure indicated and for long term, maintenance free operation under normal traffic load operation. Coordinate activation control with electrified hardware and access control interfaces. Activation switches are standard SPST, with optional DPDT availability.

B. Touch Less Wall Switch: Momentary contact door control switch with movement required activation. Single or double gang box junction box mounting.

1. Doppler radar sensor.
2. Mounting Location: As indicated on Drawings.
3. Manufacturers:

    a. Norton Door Controls (NO) – 700 Series.
    b. Securitron (SU) – WSS Series.

2.4 ACCESSORIES

A. Signage: As required by cited ANSI/BHMA A156.19 standard for the type of operator.

2.5 FINISHES

A. Standard: Designations used to indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware. Units will be sprayed with a combination of waterborne acrylic and polyester powder coat.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.6 OPENING LABELS

A. Provide 1"W x 2"H gloss polyester label imprinted with door mark and QR-type code readable via IR and visible light scan. QR code links to a security credential protected site displaying the installed door opening information. Label constructed with a high-performance, permanent acrylic adhesive resistant to chemicals, smear and scratch, and repeated freeze and thaw cycles. Face stock of label to be white or clear coated, 2.0 mil thickness with tensile strength meeting or exceeding 18,000 psi.

1. Approved Manufacturer: Openings Studio™ Smart Tags (AA).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, power connections, electrical systems interfaces, and other conditions affecting performance of automatic door operators.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 INSTALLATION

A. General: Install complete automatic door operators according to manufacturer's written instructions and ANSI/BHMA A156;19 standard, including activation devices, control wiring, remote power units if any, connection to the building's fire alarm system, and required signage.

B. Power Connection: Reference Division 26 "Electrical" Sections for connection to electrical power distribution system.

C. Access Control System: Coordinate connections and operation with access control system

D. Signage: Apply signage as required by ANSI/BHMA A156.19 standard for type of door operator and direction of pedestrian travel.

3.3 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
2. Submit documentation of incomplete items in the following formats:

    a. PDF electronic file.
    b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

3.4 ADJUSTING

A. Comply with requirements of ANSI/BHMA A156.19 standard. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer.

3.5 DEMONSTRATION

A. Certified Installer's representative to provide eight (8) hours of training to Owner's maintenance personnel in the proper adjustment, operation, and maintenance of automatic door operators.

END OF SECTION 087113

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 08 8100

GLASS AND GLAZING

PART 1 - GENERAL

1.1. SUMMARY

A. Insulating glass and glazing as indicated on Drawings and specified herein.

1.2. RELATED SECTIONS

A. Section 07 9000 – Joint Sealers.

B. Section 08 4113 – Aluminum Entrances and Storefronts.

1.3. REFERENCES

A. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

C. ASCE 7, "Minimum Design Loads for Buildings and Other Structures".

D. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings

E. ASTM C1036 - Flat Glass.

F. ASTM C1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.

G. ASTM E546 - Test Method For Frost Point of Sealed Insulating Glass Units.

H. ASTM E576 - Test Method For Dew/Frost Point of Sealed Insulating Glass Units in Vertical Position.

I. ASTM E773 - Test Method for Seal Durability of Sealed Insulating Glass Units.

J. ASTM E774 - Sealed Insulating Glass Units.

K. ASTM E2010- Standard Test Method for Positive Pressure Fire Tests of Window Assemblies

L. GANA - Glass Association of North America.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

M. Laminators Safety Glass Association - Standards Manual.

N. SIGMA - Sealed Insulated Glass Manufacturers Association.

1.4. SYSTEM DESCRIPTION

A. Design glass and glazing materials of this Section to provide continuity of building enclosure vapor and air barrier:

1. In conjunction with materials described in Section 07 9000 – Joint Sealers.
2. To utilize the inner lite of insulated sealed units for the continuity of air and vapor seal.
3. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

B. Glass type and thickness shall be determined by using ASTM E 1300.

C. Loads are to be determined using:

1. Applicable local building code requirements
2. Requirements as defined in ASCE 7.

D. Glass and glazing installation at exterior surfaces shall be designed to withstand the design wind loads for the location of the project and conform to structural requirements of state and local codes.

E. The probability of breakage to use in calculating the thickness of glass shall be:

1. One lite per thousand for exterior lites above first story and interior overhead applications.
2. Eight lites per thousand for exterior glass at grade and interior applications.

F. Glass and glazing installation at interior partitions shall be able to withstand a lateral load of 5 psf and a point load of 200 pounds anywhere on it's surface or other loading as required by governing local codes.

G. Limit glass deflection to flexure limit of glass with full recovery of glazing materials, whichever is less.

1.5. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Product Data

1. Glass Types: Provide structural, physical, and environmental characteristics, size limitations, special handling, or installation requirements.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, and special application requirements. Identify available colors.

C. Samples:

1. Minimum 12 inch square Samples of each type of glass indicated (including assembled insulating glass types) illustrating color and finish.
2. Minimum 12 inch long bead of glazing sealant and/or gasket, illustrating color as selected.

D. Manufacturer's Installation Instructions: Indicate special precautions required.

E. Certification: Submit certificates from respective manufacturers attesting that glass and glazing materials provided for Project comply with requirements.

1. Separate Certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to Architect.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 6000 – Product Requirements.

B. During storage and handling of glass products, provide cushions at edges to prevent impact damage.

C. Protect glass and glazing materials to comply with manufacturer's directions, and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.7. QUALITY ASSURANCE

A. Glazing Standards: Comply with recommendations of Glass Association of North America (GANA) "Glazing Manual" and "Sealant Manual", except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this Section or other referenced standards.

B. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Insulating Glass Certification Program: Provide insulating glass units permanently marked, either on spacers or at least 1 component pane of units, with appropriate certification label of inspecting and testing organization indicated below:

1. Insulating Glass Certification Council (IGCC), or Associated Laboratories, Inc. (ALI).

D. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

1.8. PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not install glass or glazing materials when ambient temperature is less than 50 degrees F.
2. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.9. COORDINATION

A. Coordinate Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.

1.10. WARRANTY

A. Provide 10 year manufacturer's written warranty per Section 01 7800 – Closeout Submittals.

B. Warrant materials and workmanship provided are guaranteed against defects; including coverage for sealed glass units from seal failure, inter-pane dusting or misting, and replacement of same, after completion and final acceptance of Work.

1. Repair defects from faulty materials or workmanship developed during the guarantee period, or replace with new materials, at no expense to Owner.

PART 2 - PRODUCTS

2.1. MANUFACTURERS OR FABRICATORS

A. Subject to compliance with requirements, provide products from 1 of the following manufacturers or fabricators:

1. Advanced Glass Systems.
2. Cardinal IG

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3. Falconer Glass Industries.
4. Guardian Industries.
5. Interpane Glass Company.
6. Pilkington Building Products
7. PPG Architectural Glass.
8. Nippon Electric Glass Company.
9. Monsanto Company, Inc.
10. Viracon.

B. Substitutions: Comply with Section 01 6300 – Product Substitution Procedures.

2.2. GLASS MATERIALS, GENERAL

A. Thickness, stop and bite dimensions, and strengths of glass shall be determined:

1. By the manufacturer of the unit being glazed for factory glazed units, based on the size of the glass and the loading criteria due to impact and wind based on local code requirements and ASTM C 1300.
2. By the installer of site glazed units based on the size of the glass and the loading criteria due to impact and wind based on local code requirements and ASTM C 1300.

B. The manufacturer or glazier shall verify in the shop drawings that glass and detailing of the installed unit meets or exceeds the structural requirements of the unit based on governing building and safety codes and ASTM E 1300.

C. Heat treated, clear flat glass shall conform to ASTM C 1036 and ASTM C 1048, Type I, Class 1, quality q3;

1. Kind HS for heat strengthened.

D. Heat treated, tinted flat glass shall conform to ASTM C 1036 and ASTM C 1048, Type I, Class 1, quality q3;

1. Kind HS for heat strengthened.

2.3. TEMPERED GLASS, GENERAL

A. Apply low-e coating to tempered glass after tempering.

1. Low-e coating to be sputter coat applied after tempering.
2. DO NOT TEMPER GLASS THAT HAS A PYROLITIC LOW-E COATING.

2.4. SEALED INSULATING GLASS MATERIALS

A. Pre-assembled units consisting of organically sealed panes of glass enclosing a hermetically sealed, dehydrated air space, and complying with ASTM E774 for

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

performance classification indicated, as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design, and desiccant.

B. Heat-treated panes of kind and at locations indicated on Drawings, or if not indicated, heat- strengthened panes where recommended by glass manufacturer for application indicated, and tempered where indicated, or where safety glass is designated or required.

C. Performance characteristics designated or coated insulating glass are nominal values based on manufacturer's published performance values for units with 1/4 inch panes of glass and 1/2 inch thick air space.

D. U-values indicated are expressed in the number of Btu's per hour per square foot per degree F difference.

E. Sealing System: Dual Seal:

1. Primary sealant: polyisobutylene.
2. Secondary sealant: silicone.

F. Spacer Material: Aluminum.

G. Desiccant: Low Nitrogen Absorbing.

H. Corner Construction: Bent/Soldered.

I. Glass shall have a low-e coating where noted on the Glazing Schedule. Low-E coating to be placed on the third surface of the insulated glass units. (The outer surface of the inside pane)

2.5. ELASTOMERIC GLAZING SEALANT AND GLAZING TAPES

A. Compatibility: Select glazing sealant and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

B. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealant and tapes that have performance characteristics suitable for applications indicated and conditions at time of installation.

C. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for type, grade, class and uses.

D. Colors: Provide color of exposed sealant indicated, or if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

E. 1-Part Non-Acid Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and as applicable to uses indicated, and O; and complying with the following requirements for modulus and additional joint movement capability.

1. Medium Modulus: Tensile strength of not less than 45 nor more than 75 PSI (0.5 M Pa) at 100 percent elongation when tested per ASTM D412 after 14 days at 77 degrees F and 50 percent relative humidity.

2. Additional Capability: Test per ASTM C719 for adhesion and cohesion under maximum cyclic movement, to withstand the maximum 40 percent increase and decrease of joint width, as measured at time of application, and remain in compliance with other requirements of ASTM C920.

F. Preformed Butyl-Polyisobutylene Glazing Tape: Manufacturer's standard solvent-free butyl- polyisobutylene formulation with a solids content of 100 percent; complying with AAMA A-804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on 1 side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.

G. General: Provide products of type indicated and complying with the following requirements:

2.6. GLAZING ACCESSORIES

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.

C. Spacer Shims: Silicone, 50 to 60 Shore A Durometer hardness, minimum 3 inch long by 1/2 the height of the glazing stop by thickness to suit application. Self adhesive on 1 face.

D. Edge Blocks: Silicone blocks as required for compatibility with glazing sealant, of size and hardness required limiting lateral movement (side-walking) of glass.

E. Setting Blocks: Extruded Type II silicone rubber, ASTM D2240, Type A, 80-90 Shore A Durometer hardness, length of 0.1 inch for each square foot of glazing, or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area. Black color.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that openings for glazing are correctly sized and within tolerance.

C. Clean glazing channels, stops, and rabbets to receive the glazing materials, making free from obstructions and deleterious substances that might impair Work.

1. Remove protective coatings that might fail in adhesion or interfere with bond of sealant.
2. Comply with manufacturer's instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.

3.2. PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces to receive glazing compounds per manufacturer's recommendations.

3.3. HANDLING

A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealant, gaskets, and other glazing materials, including those of referenced glazing standards.

B. Protect glass from edge damage during handling and installation. Use a foiling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings. Do not raise or drift glass with a pry bar. Remove from Project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

1. Use a foiling block in rotating glass units to prevent damage to glass corners. Use suction cups to shift glass units within openings.

2. Remove from Project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.4. INSTALLATION

A. General Glazing

1. Install setting blocks of proper size in sill rabbet, located 1/4 of glass width from each corner, but with edge nearest corner not closer than 6 inches from corner unless otherwise required.
2. Provide spacers inside and out, of correct size and spacing, to preserve required face clearances except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
3. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
4. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
5. Apply primers to joint surfaces where required for adhesion of sealant.

B. Gasket Glazing:

1. Install gasket glazed glass as per manufacturers printed instructions.

3.5. FIELD QUALITY CONTROL

A. Manufacturer's Field Services:

1. Obtain manufacturer's field services per Section 01 4000 – Quality Requirements.
2. Require glass and glazing product manufacturers to provide field inspection of installation of their products per Section 01 4300 – Quality Requirements.
3. Monitor and report installation procedures, unacceptable conditions and field conditions encountered.

3.6. CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass. Free of smears, smudges, streaks, and spilled or splattered materials.

3.7. PROTECTION

A. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing, and held free from glass. Do not apply warning markings, streamers, ribbons or other items directly to glass, except as specifically directed in writing by Architect.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.8. SCHEDULE

A. Glass and Glazing Schedule

1. Condition: Interior Storefront

a. Tempered glass unless otherwise required for unusual safety exposure or security, in which case laminated may be used.
b. Thickness: 1/4", Clear
c. Type of Installation: Gasket Glazed

B. Glass and Glazing Schedule
1. Condition: Exterior Storefront

a. Type of Glass: Solarban 60 Low-E Insulating glass

b. Glass: Insulating glass, U-0.42 and SHGC-0.46

c. Thickness: 1"
Outer Pane at Insulating Glass: Tempered glass, Kind FT, Grey tint
Inner Pane at Insulating Glass: Laminated glass, Clear anealed
Spacer Location at Insulating Glass: Edge and at muntins
Spacer Color at Insulating Glass: bronze
Low E: Yes, on third surface

1. I. Type of Installation: Gasket Glazed

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 09 2600 - GYPSUM WALLBOARD SYSTEMS

PART 1 GENERAL

1 .01 DESCRIPTION

A. Furnish labor, equipment, materials and services as required to provide gypsum wallboard products and systems as specified in this Section in locations shown or scheduled on the drawings.
B. Related Sections include, but may not be limited to, the following:
1. Division 05, Section "Light Steel Framing", for load bearing metal studs and trusses.
2. Division 06, Section "Rough Carpentry", for gypsum sheathing.
3. Division 09, Section Gypsum Board Assemblies/

1 .02REFERENCES

A. American Society for Testing and Materials
1. ASTM A653-03 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or ZincIron
Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM C475-02 Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
3. ASTM C645-04 Standard Specification for Non-Load (Axial) Bearing Steel Stud Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
4. ASTM C665-98 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
5. ASTM C754-00 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Panel Products.
6. ASTM C840-04 Standard Specification for Application and Finishing of Gypsum Board.
7. ASTM C931-04 Standard Specification for Exterior Gypsum Soffit Board.
8. ASTM C1396-03 Standard Specification for Gypsum Board.
9. ASTM C1629-05 Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
1 O.ASTM D3273-00 Standard Test Method for Resistance to Growth of Mold on the Surface
of Interior Coatings in an Environmental Chamber.
11.ASTM D3274-00 Standard Test Method for Evaluating Degree of Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation.
12.ASTM E119-00a Standard Test Methods for Fire Tests of Building Construction and Materials.
13 .ASTM E90-02 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

B. American National Standards Institute

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. ANSI A 118.9 Test Methods and Specifications for Cementitious Backer Units.

C. Gypsum Association
1. GA-214 (latest edition): Levels of Gypsum Board Finish.
2. GA-216 (latest edition): Recommended Specifications for the Application and Finishing of Gypsum Wallboard

1.03 SYSTEM DESCRIPTION

A. Design Requirements:
1. Unless specifically noted otherwise, partitions shall extend a minimum of six inches (6") above finished ceiling line. Partition thickness and Fire Rating Classification shall be as Indicated on Drawings. See Drawings for partitions to extend to structure.
2. Where fire ratings are called for, they shall be equivalent to assemblies tested by the Underwriter's Laboratories, Inc.
3. Allowable Tolerances: Partitions shall be straight to within 1/8" in 10 feet and plumb to within 1 /8" in 10 feet. Unless indicated otherwise, corners shall be 90 degrees.

B. Structural Requirements:
1. Select steel studs as indicated on drawings and in accordance with the manufacturer's standard load tables., unless otherwise specifically indicated herein.
2. Exterior Soffits: Gypsum board soffits shall withstand a minimum positive and negative wind pressure of 20 psf and maintain a deflection of not more than 1/360 of distance between supports.
3. Interior Suspended Ceilings and Soffits: Gypsum board suspended ceilings and soffits shall maintain a deflection of not more than 1/360 of distance between supports.
4. Additional Seismic Requirements: All wall and suspended ceiling installations shall be installed and braced as required to resist seismic forces for Seismic Design Category "D" in accordance with International Building Code, 2006, Section 1613, or a lesser Category if so determined by site-specific survey.

C. Fire Resistance Ratings:
1. Where assemblies with fire ratings are indicated, provide materials and installations which are identical with those or applicable assemblies tested in accordance with ASTM E119 by testing laboratories acceptable to authorities having jurisdiction.
2. Construct assemblies identical to those indicated by reference to GA 600, or to design designations listed in Fire Resistance Directory by Underwriters Laboratories, Inc., or listing of other agencies acceptable to authorities having jurisdiction.

D. Acoustic Ratings: Where assemblies with sound ratings are indicated, provide materials and installations tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM E90. Drawings generally do not indicate full extent of caulking and sealing, or thickness of acoustical insulation required to achieve scheduled STC ratings. Contractor shall be fully responsible for providing extent and thicknesses of these materials to insure that sound transmission requirements are met.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.04 SUBMITTALS

A. Product Data: Submit list of materials proposed for use prior to installation including name of manufacturer and brand names of products, along with manufacturer's printed data sheets.

B. Shop Drawings: For curved walls, provide scaled drawings indicating wall locations and associated radii and center points.

1 .05 QUALITY ASSURANCE

A. Qualification of Manufacturer: Gypsum wallboard manufacturer shall be one listed in the Underwriters' Laboratories, Inc., "Building Materials List" (40 U8.22) BWFR.

B. Proprietary names of specific manufacturers are used in this specification for the purpose of establishing a standard of quality. Items included in those products are the minimum standards acceptable.

C. Installation Standards: Except as herein otherwise specified, this work shall be installed in accordance with the following: ASTM C754, GA-216, GA 214, and ASTM C840.

D. Special Finish Coatings: Gloss, Semi-Gloss, and Enamel paints are considered by this specification to be Special Finish Coatings. See installation requirements in PART 3 for additional information.

E. All metal drywall components and supporting members shall be hot dip galvanized in accordance with ASTM A653, G60 (Z180), or zinc-iron alloy coat in accordance with ASTM A653, A60 (ZF180).

1.06 JOB CONDITIONS

A. Deliver materials in original packages, containers or bundles bearing the brand name and name of the manufacturer.

B. Store materials in a clean, dry place protected from weather and freezing temperatures. Do not store materials directly on ground or fresh concrete.

C. Stack wallboard flat and protect during handling and storage to prevent sagging and damage to ends, edges and surfaces.

D. During application and finishing of gypsum wallboard, maintain a uniform temperature between 55 degrees F. and 75 degrees F., and provide ventilation to eliminate excessive moisture. Avoid drafts during dry, hot weather to prevent too rapid drying. Do not install interior products until installation areas are enclosed and conditioned. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
E. Examine surfaces to receive gypsum wallboard for defects which might impair the quality of finished installation, and do not start work until such defects have been corrected.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Steel Framing and Furring (unless otherwise indicated): Subject to compliance with requirements of these Specifications, provide products from one of the following:

1. Clark Steel Framing Systems (Jefferson, GA) (www.clarksteel.com)
2. Dietrich Industries, Inc. (McDonough, GA) (www.dietrichindustries.com)
3. Marino Ware; Division of Ware Ind. (Griffin, GA) (www.marinoware.com)
4. Telling Industries (Cambridge, OH) (www.tellingindustries.com)

B. Gypsum Board and Related Products: Subject to compliance with requirements of these Specifications, provide products from one of the following: (Provide impact resistant where indicated on plans)

1. USG (Chicago, IL).
2. CertainTeed (Tampa, FL).
3. National Gypsum Company (Charlotte, NC) (www.nationalgypsum.com)
5. Lafarge North America, Inc. (Herndon, VA)
6. Temple-Inland (Diboll, TX) (www.temple.com)
7. Quiet Solution (Sunnyvale, CA) (www.quietsolution.com)

2.02 GENERAL

A. Studs, runners and furring channels shall comply with ASTM C645. Steel material shall be yield strength, Fy = 33 ksi.

B. Runners: Provide size and type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of framing to other work.

2.03 FRAMING SYSTEMS

A. Standard Series, 25 gauge, metal studs and runners, with spacing as designated on the drawings, shall be used for the following applications:
1. Interior non-loadbearing partitions up to 16'-0" tall for 3-5/8 inch or larger studs and to 12'-6" tall for 2-1/2 inch studs.
2. Interior drywall ceiling breaks.
3. Miscellaneous non-structural bracing and blocking.

B. Standard Series, 20 gauge, metal studs and runners, with spacing as designated on the drawings, shall be used for the following applications:
1. Interior non-loadbearing partitions over 16'-0" tall for 3-5/8 inch or larger studs.
2. Interior non-loadbearing partitions supporting wall hung items such as wall mounted

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B. Refer to Division 01 8113 for LEED Sustainability Requirements.

cabinets and casework.
3. Interior partitions shown to support ceramic tile walls and/or wainscots.
4. Exterior non-load bearing partitions up to 12'-0" tall. Maximum two stories above grade.

C. Drywall suspension system shall be one of the following:
1. Pre-Manufactured System: Heavy-duty, hot-dipped galvanized, interior/exterior framing system consisting of main and cross tees with minimum 1-3/8 inch face dimension and 1-1/2 inch height dimension, and pre-fabricated clips and edge moldings, allowing compatibility to acoustical suspension grids. Provide 0.135 inch (3.5 mm) galvanized hanger wire.
a) Acceptable Products:
1) USG; Drywall Suspension System.
2) Donn; Drywall Suspension System.
3) Armstrong; Drywall Grid System
2. Site-built Suspension System: Heavy-duty, fire-rated, interior/exterior framing consisting of the following:
a) Hanger wire: 0.162 inch (4 mm) galvanized steel wire.
b) Tie wire: 0.0625 inch (1.6 mm) galvanized steel wire.
c) Carrying channels: 1-1/2” deep, 16 gauge galvanized steel sections.
d) Furring channels: 7/8” x 2-3/4”, 26 gauge galvanized steel, roll-formed, hat-shaped sections.
e) Furring channel clips: 1-1/2” x 2-3/4” galvanized steel clips.

3. Where fire rated assemblies are required, system shall be fire rated.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate sizes and locations of surface mounted accessories and equipment which require backer plates. Install additional studs for attachment of backer plates in correct locations to receive surface mounted accessories as recommended by the accessory manufacturer.

B. Coordinate installation of concealed fire resistant wood blocking and furring, if required, for carpentry and millwork, kitchen equipment, toilet and bath accessories, shelving, and all other wall mounted items indicated on the drawings.

C. Locate prior to installation of ceiling suspension systems all overhead support system points for loads not capable of being supported by ceiling suspension systems. Install such overhead support system points prior to starting ceiling suspension system.

3.02 INSTALLATION OF FRAMING SYSTEMS

A. Metal Studs and Runners
1. Align partitions accurately according to partition layout. Attach metal runners to floor slab

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

and underside of structure above with tempered masonry nails or power driven anchors spaced 16" o.c. maximum.
2. Where partitions are indicated to extend to underside of structure, each stud shall extend full height without splices. Where stud height exceeds maximum recommended by manufacturer, provide metal stud diagonal bracing to structure above. Where partitions are indicated to terminate above ceiling, each stud shall terminate at continuous runner and be braced to underside of structure with metal studs stagger spaced 48" o.c., and splayed 30 degrees from vertical.
3. Position studs vertically in runners spaced at intervals shown on drawings. Anchor studs to metal runners utilizing screws.
4. Where noted or detailed, provide double studs and nested studs.
5. Provide double studs and one jack-stud at all window and door openings.
6. Where framing is shown to support ceramic or masonry tile, provide member spacing to limit deflection to L/360.
7. Isolate non-load-bearing steel framing from building structural beams to prevent transfer of vertical loads while providing lateral support.
a) Connect vertical deflection clips to bypassing and infill studs and anchor to primary building structure.
b) Install single or double deep-leg deflection tracks and anchor to building structure.
8. Sprayed Fire-Resistive Materials: Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
a) After sprayed fire-resistive material is applied, remove it only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fireresistivematerials from damage.

B. Pre-Manufactured Ceiling Support System
1. Space hanger wires 48” o.c. along main tees and within 6” of ends. Anchor hanger wires into overhead structure utilizing power driven anchors.
2. Install perimeter wall angles.
3. Erect module of main tees 48" o.c. and cross furring channels at 24" o.c., secure to overhead structure with hangar wire and secure to perimeter wall angle.

C. Site-Built Ceiling Support System
1. Space hanger wires 48” o.c. along carrying channels and within 6” of ends of carrying channel runs. Anchor hanger wires into overhead structure utilizing power driven anchors.
2. Install carrying channels at 48”o.c. and within 6” of intersecting walls. Position channels for proper ceiling height, level, and secure with hanger wire saddle-tied along channels. Provide 1” clearance between runners and abutting walls. At channel splices, interlock flanges, lap 12” and secure each end with double-strand of tie wire.
3. Erect metal furring channels at right angles to carrying channels. Space furring channels 24” o.c., and within 6” of walls. Provide 1” clearance between channel end and abutting walls. Attach furring channels to carrying channels with furring channel clips installed on alternate sides of carrying channel. At splices, nest furring channels at least 8” and

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

securely wire-tie each end with double strand of tie wire.
4. At openings that interrupt the carrying or furring channels, install additional cross reinforcing to restore lateral stability of grillage.

D. Wall Furring System
1. Attach metal furring channels vertically (or horizontally if so indicated) at 16” centers. Secure channels with fasteners spaced 24” o.c. Secure Z-furring along narrow leg.

3.03 METAL TRIM

A. Apply metal trim to wallboard face layer at edge of partitions at intersection of dissimilar walls or materials. Install trim by stapling flange into face layer.

B. Install corner beads at all exterior corners by stapling flanges into face layer.

C. Control Joints:
1. Install control joints in walls in locations shown on drawings, or 30' max., by stapling into gypsum board. Support edges with separate studs. Provide 1-1/2 in. (38 mm) cold-rolled channel alignment stabilizers spaced a maximum of 5 ft. (152 em) vertically. Channels should be placed through holes in the stud web of the first two adjacent studs on both sides of the joint and securely attached to the first adjacent stud on either side of the joint.
2. Install horizontal control joints at each floor level where board is vertically continuous at stairwells and other similar areas, and where wings of "L" and "T"-shape ceilings are joined.
3. Provide control joints in ceilings where framing or furring changes direction, and in continuous ceilings, not to exceed 40'-0" centers. Break framing at joint locations.
4. Allow plastic protective tape to remain in place until joint finishing is complete.

D. Install USG No. 402 metal trim at intersection of exterior ceilings with a vertical surface.

3.06 CAULKING

A. Caulking: Apply bead of caulking where metal trim is utilized at intersection of partition with dissimilar walls or materials.

B. Acoustical Sealant: Apply bead of acoustical sealant between subfloor surfaces and edges of gypsum wallboard panels at both sides of sound rated partitions. Install bead of sealant around perimeter of electrical, mechanical and plumbing devices where these devices penetrate sound rated partitions.

C. Water Resistant Sealant: Apply to all raw cut edges of water resistant panels.

3.07 JOINT AND FASTENER CONCEALMENT (INTERIOR)

A. Prepare joint compounds in accordance with the manufacturer's printed instructions. Allow a minimum drying time of 24 hours between coats. Sand coats after second and third

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

application. The minimum acceptable level of finishing shall be Level 5 finish in accordance with GA-214. See 09 2116

B. Embedment Coat - Apply a thin, uniform layer of joint compound (embedding type) 3" wide over joint to be reinforced. Center tape over joint and seat into compound, leaving sufficient compound under tape to provide bond. Apply a skim coat of compound immediately after embedding tape. Inside vertical corner angles shall be reinforced with tape folded to conform to the adjoining surfaces and to form a straight true angle.

1. Fire Rated Mold and Mildew Resistant Panels: Use fiberglass tape and setting-type joint compound.

C. Second Coat - After drying, cover embedding compound with second coat of compound spread over and beyond tapered edge area of board and feathered at edges.
D. Third Coat- Cover second coat with topping compound spread over and beyond the edge or preceding coat and feathered with a smooth uniform finish.
E. Fastener Concealment - Treat dimples and fasteners (and holes where fasteners are removed) with three (3) coats of joint compound applied as each coat is applied to joints. Flanges of corner beads and trim members shall be concealed by three (3) coats of compound.

3.08 JOINT AND FASTENER CONCEALMENT (EXTERIOR)

A. Pre-fill joint of ceiling board with Durabond SL Joint Compound.

B. After pre-fill has hardened, tape all joints with compound. When compound hardens, immediately apply a fill coat of compound and allow to harden.

C. Apply compound over flanges of control joints and metal trim.

D. Spot all fastener heads and dimples with compound.

E. When compound has dried twenty-four (24) hours, all exposed surfaces shall be painted in accordance with the Paint Schedule.

3.09 SOUND INSULATION

A. Install sound insulation blankets to fill the full height and width of the stud cavity. Where partitions are scheduled to extend to bottom of roof slab, extend insulation also.

B. Fit blankets behind electrical outlets, bracing, fixture attachments, and other penetrating items.

C. Where shown on drawings, install sound insulation batts atop acoustical ceiling tiles. Batts shall fill the space between suspension grid members.

3.10 FIXTURE ATTACHMENT

A. Provide reinforcing in all drywall partitions and walls to receive all items which are to be attached, including but not limited to, grab bars, cabinets, shelving, lockers and corner guards.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. When supports for these items are not detailed on the drawings, they shall be installed in accordance with details in USG Metal Framed Drywall Systems Folder SA-923/1-00, 2000 Edition page 31. Grab bars and shelving supports shall be designed for "heavy" fixture attachment.

C. Supporting devices and accessories which are furnished under toilet accessories sections of the specifications shall be incorporated into this portion of the work.

3.11 CLEANING

A. Remove gypsum dust and joint compound dust from completed wall and ceiling surfaces.
B. Remove construction debris and trash from mechanical chases and wall cavities before enclosing such spaces.

3.12 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 09 2813

CEMENTITIOUS BACKING BOARDS

PART 1 - GENERAL

1.1. RELATED WORK SPECIFIED ELSEWHERE

A. Section 09 2116 – Gypsum Board.

B. Section 09 3113 – Tile.

1.2. SUBMITTALS

A. Product Data: Catalog sheets, specifications, and installation instructions for tile backer board.

B. Samples:

1. Tile Backer Board: 12 inches square.
2. Joint Reinforcement Tape: 12 inches long.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Tile Backer Board: Cement mortar building board specifically for use as backer for ceramic tile, one of the following:

1. Durock Tile Backer Board by United States Gypsum, 101 South Wacker Drive, Chicago, IL 60606, (800) 874-4968.
2. Wonder-Board by Gold Bond Building Products National Gypsum Company, 2001 Rexford Rd., Charlotte, NC 28211, (800) 628-4662.
3. Substitutions: Comply with Section 01 6300 – Product Substution Procedures.

B. Joint Reinforcement: Tile backer board manufacturer's recommended adhesives, fillers, and tapes.

C. Fasteners: Tile backer board manufacturer's recommended nails or screws.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 3 - EXECUTION

3.1. INSTALLATION

A. Install the Work of this Section in accordance with the manufacturer's printed instructions.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 09 3113

TILE

PART 1 - GENERAL

1.1. SUMMARY

A. Interior ceramic floor, wall, and base tile.

B. Interior porcelain tile floor, walls, and base finish using thin-set application method.

C. Related membranes, mortar, adhesive, grout, trim, and accessories.

D. Tile set on concrete substrates.

1.2. RELATED SECTIONS:

A. Section 03 3000 – Cast-In-Place Concrete.

B. Section 09 2116 – Gypsum Board Assemblies.

1.3. REFERENCES

A. ANSI A108/A118/A136-1999 Specifications for the Installation of Ceramic Tile

1. 2003-2004 TCA Handbook for Ceramic Tile Installation

1.4. SYSTEM DESCRIPTION

A. Performance Requirements:

1. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C1028. Appendix to the ADAAG, in Section A4.5 defines slip-resistant as a static coefficient of friction of 0.6 for floor areas.

1.5. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Product Data: Submit data indicating material specifications, characteristics, and instructions for using adhesives, grouts, mortars, and additives.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Samples: Mount tile and apply grout on one 12 inch by 12 inch plywood panel (or other size required by Architect) to indicate pattern, color variations, and grout joint size variations.

D. Submit manufacturer's installation instructions.

E. Shop Drawings are required for paper-backed, factory assembled patterned tile.

F. Maintenance data: Include recommendations for cleaning and stain removal methods, and cleaning materials per Section 01 7000 – Execution Requirements.

G. Manufacturer's written certification that ADAAG Requirements for Static Coefficient of Friction have been met for this Project.

H. Closeout Submittals:

1. Submit manufacturer's complete maintenance data per Section 01 7700 – Closeout Procedures.
2. Provide 2 copies of manufacturer's Maintenance Manual for complete care of tile units. Submit to Owner, through Architect, for review and approval.

    a. Provide tile manufacturer's and supplier's name, address, and telephone number. Include for each product the product names, serial or model numbers, and colors.

1.6. QUALITY ASSURANCE

A. Conform to TCA Handbook for Ceramic Tile Installation.

B. Comply with the requirements of ANSI A 108 and ANSI A 118

C. Qualifications:

1. Manufacturer: Company specializing in manufacture of products specified in this Section with minimum 5 years documented experience.
2. Installer: Company specializing in applying Work of this Section with minimum 5 years documented experience.
3. Comply with 01 4000 – Quality Requirements.

D. Regulatory Requirements:

1. Conform to "Americans with Disabilities Act Accessibility Guidelines" (ADAAG) criteria for Static Coefficient of Friction:

E. Single-Source Responsibility:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Obtain each color, grade, finish, type composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of Work.
2. Obtain ingredients for setting and grouting materials of a uniform quality from 1 manufacturer for each cementitous and admixture component, and from 1 source or producer for each aggregate.

F. Salient Features: Drawings and Specifications are based on proprietary literature from manufacturer specified for tiles and accessories. Material was selected based on specified manufacturers' colors and patterns, which are considered among salient features of specified materials. Other manufacturers shall comply with the following requirements in order to be considered for substitution:

1. Provide products in full compliance with materials, colors, textures, patterns, and other features indicated.
2. Products are submitted to Architect for review and consideration for written prior approval per Section 01 3300 – Submittal Procedures.
3. Understand that materials, colors, textures, patterns, and other features indicated have been selected to establish a cohesive design element of Project, therefore Architect is sole judge of compliance of substitutions with specified salient features.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 6000 – Product Requirements.

B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements of ANSI A137.1 for labeling sealed tile packages.

C. Protect adhesives from freezing or overheating per manufacturer's instructions.

D. Prevent damage or contamination to materials by water, foreign matter, and other causes.

E. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units.

1.8. PROJECT CONDITIONS

A. Environmental Requirements:

1. Maintain environmental conditions and protect Work during and after installation to comply with referenced standards and manufacturer's written recommendations.
2. Vent temporary heaters to the exterior to prevent damage to tile Work from carbon dioxide build-up.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3. Maintain temperatures at 50 degrees F or more in tiled areas during installation and 7 days after completion, unless referenced installation standard or manufacturer's instructions require higher temperatures.

1.9. MAINTENANCE

A. Extra Materials:

1. After completion of Work, deliver not less than 2 percent of each type, color, and pattern of tile and base, exclusive of material required to properly complete installation.
2. Provide accessory components as required, and replacement materials from same production run as materials installed.
3. Package replacement materials with protective coverings, identified with appropriate labels.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Ceramic Tile: Subject to compliance with requirements, provide products from 1 of the following manufacturers:

1. Mosa Tile 247 W 35th Street – New York, NY 10001
   Phone: 212-729-6332 Website: www.mosa.com

B. Porcelain Tile: Subject to compliance with requirements, provide products from 1 of the following manufacturers:

1. Daltile International 7834 C.F. Hawn Freeway - Dallas, Texas 75217
   Phone: 800-933-TILE Website: www.daltileproducts.com

C. Mortars, Adhesives, and Grouts: Subject to compliance with requirements, provide products from 1 of the following manufacturers:

1. C-Cure.
2. DAP, Inc.
3. Hydroment from Bostik.
4. Laticrete International, Inc.
5. Mapei Corporation.
6. Substitutions: Per 01 6300 – Product Substitution Procedures.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

D. Metal Trim Edge, Stair Nosing and Accessories (brushed finish UNO)

1. Schluter 194 Pleasant Ridge Road – Plattsburgh, NY 12901-5841
   Phone: 1-888-472-4588 Website: www.schluter.com
2. Substitutions: Per 01 6300 – Product Substitution Procedures.

2.2. MATERIALS

A. Ceramic Floor Tile: ANSI/TCA A137.1.

1. Ceramic Wall Tile: ANSI/TCA A137.1-1992. See Tile Schedule for tile types.

B. Porcelain Base Tile: ANSI/TCA A137.1; match floor and/or wall tile for size, moisture absorption, surface finish, and color. Conform to the following:

1. Internal Corner: Coved.
2. External Corner: Coved. Mitre with wet saw cut where exterior corners are not manufactured for type of tile specified.

C. Porcelain Floor Tile: ANSI/TCA A137.1; unglazed and non-slip, frost proof and stain resistant, alkali and acid resistant. See Tile Schedule for tile types.

D. Porcelain Base Tile: ANSI/TCA A137.1; match wall tile for moisture absorption, surface finish, and color. See Tile Schedule for tile types.

1. Internal Corner: Coved.
2. Top Edge: Bull Nosed.
3. External Corner: Coved. Mitre with wet saw cut where exterior corners are not manufactured for type of tile specified.

2.3. SETTING MATERIALS

A. Comply with pertinent recommendations contained in current edition of Tile Council of America (TCA) "Handbook for Ceramic Tile Installation".

B. Special tile setting mortars will be considered by Architect when complete technical data is submitted in advance.

2.4. GROUT MATERIALS

A. Comply with pertinent recommendations contained in the Tile Council of America, latest Edition, "Handbook for Ceramic Tile Installation", in colors selected by Architect from standard colors available from the approved manufacturers.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Sand-Portland Cement Grout:

1. Materials:

a. Portland cement: Comply with ASTM C150, Type I or II.
b. Sand complying with ASTM C144.
c. Water: Clean, potable, free of foreign matter.

2. Where this grout is indicated on Drawings, or is otherwise directed or required, provide a job-mix consisting of:

a. Joints less than 1/8 inch wide: 1 part cement to 1 part fine graded sand.
b. Joints 1/8 to 1/2 inch wide: 1 part cement to 2 parts fine graded sand.
c. Joints wider than 1/2 inches: 1 part cement to 3 parts fine graded sand.

C. Commercial Portland Cement Grout:

1. Commercially prepared mixture of Portland cement and other ingredients producing a water-resistant, dense, uniformly colored material.
2. Secure Architect's written approval of proposed material prior to use.

D. Provide other materials, not specifically described, but required for a complete and proper installation, subject to approval of Architect.

E. Grout to be sealed.

2.5. THRESHOLDS

A. Solid Polymer Thresholds: Made from homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without pre-coated finish.

1. Acceptable Manufacturers:

a. Avonite, Inc.
b. DuPont Polymers.
c. Formica Corporation.
d. Nevamar; International Paper; Decorative Products Division.
e. Wilsonart International; Div. of Premark International, Inc.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2. PREPARATION, GENERAL

A. Protect surrounding Work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing surfaces to acceptable flatness tolerances.

3.3. SUB-SLAB PREPARATION, GENERAL

A. Broom clean slab thoroughly.

B. Prepare sub-slab per TCA and mortar manufacturer's recommendations.

C. Ensure that sub-slab is true and to within 1/4 inch per 10 feet. Pitch sub-slab as required by Drawings.

D. Verify that no sealers or curing compounds have been used on sub-slab. If so, remove compounds or scarify slab to ensure a good bond.

E. Finish sub-slab with steel troweled finish or light broom finish.

3.4. INSTALLATION, GENERAL

A. General:

1. Comply with ANSI A108.1, ANSI A108.2 and the "Handbook for Ceramic Tile Installation" of the Tile Council of America (TCA), latest Edition, except as otherwise directed by Architect.

B. Install setting material, tile, and grout according to TCA Handbook for Ceramic Tile Installation, Handbook Number:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Maintain minimum temperature limits and installation practices recommended by materials manufacturers.

D. Do not install tile floors over membrane until the membrane has been tested and approved.

E. Limits of Tile:

1. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruptions.

F. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.

G. Joining Pattern:

1. Lay tile in pattern indicated on Drawings or directed by Architect.

H. Align joints when adjoining tiles on floor, base, trim, and walls are same size.

I. Lay tile Work, and center the tile fields, both directions in each space or on each wall area.

J. Adjust tile layout to minimize tile cutting.

K. Provide uniform joint widths.

L. Provide expansion and control joints where shown on Drawings, and where otherwise recommended by the "Handbook for Ceramic Tile Installation" of the Tile Council of America (TCA). Seal joints per Section 07 9100 of these Specifications.

M. Sound tile after setting. Replace hollow sounding units.

N. Allow tile to set for a minimum of 48 hours prior to grouting. Grout tile joints.

O. Apply sealant to junction of tile and dissimilar materials and at junction of dissimilar planes.

P. Membrane installation:

3.5. TILE FLOORS SET ON CONCRETE SLAB

A. Tiles set with organic or epoxy adhesives.

1. Thin set tiles to sub-slab with organic or epoxy adhesives.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Back butter damp tiles prior to setting. Soak porous tiles as per manufacturer's instructions. Wipe all tiles of free surface water before setting.

C. Install tiles level, true and coplanar with adjacent tiles with no lippage.

D. Install expansion joints, where required, per details on Drawings.

E. Set tiles per approved on-site layout.

3.6. WALL TILE IN DRY AREAS

A. Set CBU or backer board over plywood substrate. Fasten to substrate with screws or galvanized roofing nails at 6 inches on center each way. Ensure that there is no lippage where sheets abut. Tape joints with fiberglass mesh tape and bed in with latex-portland cement mortar. Ensure that surface is true and plumb and that corners are true and square before starting installation of tile.

B. Wall tile at dry areas may be set over water resistant gypsum board, ASTM C 630, (green board), with latex-Portland cement mortar or organic adhesives.

C. Set tiles per approved on-site layout.

D. Carefully miter outside corners where bullnose and other trim are not available.

E. Thin-set wall tile over CBU with latex-Portland cement mortar.

3.7. CLEANING AND SEALING

A. Clean Work per Section 01 7000 – Execution Requirements.

B. Upon completion of placing and grouting, clean Work of this Section per recommendations of manufacturers or materials used.

C. Protect metal surfaces, cast iron, and vitreous items from effects of acid cleaning.

D. Flush surfaces with clean water before and after cleaning.

E. Provide tile surfaces clean and free from cracked, broken, chipped, unbonded, and otherwise defective units.

F. Seal tile per manufacturer's printed instructions.

3.8. PROTECTION

A. Protect finished Work per Section 01 5000 – Temporary Facilities and Controls.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Protect tile surfaces to prevent damage and wear prior to acceptance of Work at Substantial Completion.

PART 4 - SCHEDULE

4.1. TILE SCHEDULE

A. See Finish Schedule in drawings.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 09 5000

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions 1 Specification sections apply to work of this section.

1.2. SUMMARY

A. Section Includes

1. Acoustical ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

B. Related Selections

1. Section 02 4113 – Selective Building Demolition
2. Section 09 2116 – Gypsum Board Assemblies
3. Division 23 – HVAC Air Distribution
4. Division 26 – Electrical

C. Alternates

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.

2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.3. REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
9. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material
    a. Armstrong Fire Guard Products
10. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
11. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
12. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
13. ASTM E 1264 Classification for Acoustical Ceiling Products

B. International Building Code

C. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

D. NFPA 70 National Electrical Code

E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

F. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

G. International Code Council-Evaluation Services Report - Seismic Engineer Report

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. ESR 1308 - Armstrong Suspension Systems

H. International Association of Plumbing and Mechanical Officials - Seismic Engineer Report

1. 0244 - Armstrong Single Span Suspension System

I. California Department of Public Health CDPH/EHLB Emission Standard Method Version 1.1 2010

J. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings

1.4. SYSTEM DESCRIPTION

A. Continuous/Wall-to-Wall

1.5. SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.

D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6. QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
2. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.
3. Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory

B. Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.7. DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8. PROJECT CONDITIONS

A. Space Enclosure:

B. Building areas to receive ceilings shall be free of construction dust and debris. Products with hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

1.9. ALTERNATE CONSTRUCTION WASTE DISPOSAL

A. Ceiling material being reclaimed must be kept dry and free from debris

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Contact the Armstrong Recycle Center a consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant with provide assistance to facilitate the recycling of the ceiling.

C. Recycling may qualify for LEED Credits:

1. LEED 2009 - Category 4: Material and Resources (MR)
   a. Credit MRc2: Construction Waste Management
2. LEEDv4 - MRp2 - Construction Waste Management Planning Qualifies as a material stream (non-structural) targeted for diversion. Ceilings will be source-separated and diverted through the Armstrong Ceiling Recycling Program.
3. LEEDv4-MRc5 -
   a. Option 1: Divert ceilings to qualify for one of the 3 material streams (50%)
   b. Option 2: Divert ceilings to qualify for one of the 4 material streams (75%)

1.10. WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping
2. Grid System: Rusting and manufacturer's defects

B. B. Warranty Period:

1. Acoustical panels: Ten (10) years from date of substantial completion.
2. Grid: Ten (10) years from date of substantial completion.
3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is Thirty (30) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11. MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Ceiling Panels:

1. Armstrong World Industries, Inc.
2. Or Equal

B. Suspension Systems:

1. Armstrong World Industries, Inc.
2. Or Equal

C. Perimeter Systems

1. Armstrong World Industries, Inc.
2. Or Equal

2.2. ACOUSTICAL CEILING UNITS

A. Acoustical Panels Calla Type AP

1. Surface Texture: Smooth
2. Composition: Mineral Fiber
3. Color: Black
4. Size: 24IN x 24IN
5. Edge Profile: Square Lay-In 15/16IN Vector with 1/4” reveal.
6. Noise Reduction Coefficient(NRC): ASTM C 423; Classified with UL label on product carton 0.80.
7. Ceiling Attenuation Class (CAC) : ASTM C 1414; Classified with UL label on product carton 33.
8. Articulation Class (AC): 170
9. Flame Spread: ASTM E 1264; Class A (UL)
10. Light Reflectance White Panel: ASTM E 1477; 0.86
11. Dimensional Stability: HumiGuard Plus
12. Recycle Content: Post-Consumer Waste - 1% Pre-Consumer Waste - undefined
13. Acceptable Product: Calla Vector, 2814 as manufactured by Armstrong World Industries

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.3. METAL SUSPENSION SYSTEMS

A. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

1. Structural Classification: ASTM C 635 normal duty
2. Color: Black and match the actual color of the selected ceiling tile, unless noted otherwise.
3. Acceptable Product: Prelude XL 15/16" Vector as manufactured by Armstrong World Industries

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.

D. Edge Moldings and Trim:

1. 780036 - 12ft Hemmed Angle Molding

E. Accessories

1. ALBERC2 - aluminum systems - 2" Aluminum Beam End Retaining Clip
2. BERC2 - steel - 2" Beam End Retaining Clip
3. BERC - Beam End Retaining Clip
4. SJMR15 - Seismic Joint Clip - Main Beam - 15/16" Suspensions
5. SJMR09 - Seismic Joint Clip - Main Beam - 9/16" Suspensions
6. SJCG - PeakForm Suspension - Seismic Joint Clips CT
7. SJCSI - Square Bulb Suspension - Seismic Joint Clip CT
8. ES4 - for 15/16" Prelude Expansion Sleeves
9. ES49 - for 9/16" Suprafine
10. ES76004 for 1/4" Silhouette Suspension
11. ES76008 - for 1/8" Silhouette Suspension
12. STAC - Single Tee Adapter Clip
13. 7445 - 48" Stabilizer bar - not required when using the BERC2
14. 7425 - 24" Stabilizer bar - not required when using the BERC2

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2. PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3. 3.3 INSTALLATION

A. Follow manufacturer installation instructions.

B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

C. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4. ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

C. Before disposing of ceilings, contact the Armstrong Recycling Center at 877-276-7876, select option #1 then #8 to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant with provide assistance to facilitate the recycle of the ceiling.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

Section 09 54 23 - Linear Metal Ceiling System

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Un-perforated linear laminate / metal ceiling panels
2. Acoustical backing.
3. Suspension assemblies
4. Accessories; provide other necessary items including devices for attachment overhead construction, secondary members, splines, splices, connecting clips, wall connectors, wall angles required for a complete installation.
5. Supplemental support framing: Provide fully engineered secondary framing as required to meet code, conforming to layout shown in drawings, to support direct-hung metal ceilings suspension system.
6. Coordinate layout and installation of items penetrating or being installed in ceiling systems with responsible trades.

B. Related Sections / Work:
1. Sections 05 40 00 – Cold-Formed metal Framing
2. Sections 09 20 00 – Plaster and Gypsum Board
3. Sections 09 50 00 – Acoustical Ceilings
4. Sections 09 90 00 – Paintings and Coatings
5. Division 23 – Heating, Ventilating and Air Conditioning
6. Division 26 - Electrical

C. Alternates (Substitutions):

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Prior approval: unless otherwise provided for in the contract documents, proposed product substitutions may be submitted. Approval of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability. Approved products will be set forth by addenda.

2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet the requirements for this section, including but not necessarily limited to the following: single source materials supplier (specified in Section 1.5); panel design, size, composition, color and finish; suspension system component profiles and sizes; and compliance with the referenced standards

D. This Section covers the general requirements only for acoustical laminate / metal ceilings as shown on the drawings. The supplying and installation of additional accessory features and other items not specifically mentioned herein, but which are necessary to make a complete installation shall also be included or clarified accordingly.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A641 -"Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire"

2. A653 - "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot-Dip process"

3. B209 - "Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate"

4. B633 - "Standard Specification for Electrodeposited Coatings of Zinc on Iron or Steel"

5. C423 - "Sound Absorption and Sound Absorption Coefficients by Reverberation Room Method"

6. C635 - "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings"

7. C636 - "Recommended Practice for Installation of Metal Ceiling Suspensions Systems for Acoustical and Lay-in Panels"

8. D1002 - "Practice for Adhesion Resistance"

9. D1044 - "Practice for Abrasion Resistance"

10. D1876 – "Peel Resistance of Adhesives"

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

11. E84 - "Standard Test Method for Surface Burning Characteristics of Building Materials"

12. E488 - "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements"

13. E580 - "Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint"

14. E795 - "Standard Practices for Mounting Test Specimens during Sound Absorption Tests"

15. E1190 - "Standard Test Methods for Strength of Power Actuated Fasteners Installed in Structural Members"

16. E1264 - "Classification for Acoustical Ceiling Products"

17. E1477 - "Standard Test Method for Luminous Reflectance factor of Acoustical Materials by use of Integrating-Sphere Reflectometers"

B. Applicable LEED Environmental Categories and Credits and performance requirements as indicated:

1. Material and Resources (MR)

   a. MR Credit 4.1 & 4.2 – Recycled Content

   b. MR Credit 5.1 & 5.2 – Regional Materials

2. Innovation in Design (IC)

   a. IC Credit 1.1 – Enhanced Acoustical Performance

C. National Electrical Manufacturers Association (NEMA) Standard 11-14-95 for Chemical Resistance.

D. Ceiling & Interior Systems Construction Association (CISCA) "Ceiling Systems Handbook".

1. Guidelines for Seismic Restraint

   a. Acoustical Tile and Lay-in Panels - Zones 0 - 2

   b. Direct Hung Suspended Ceiling Assemblies - Zones 3 & 4

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

E. Local Building Code (IBC), current edition requirements.

1.4 SUBMITTALS

A. Product Data: Manufacturers product data for each type of product specified in this section.

B. Product Certification: Manufacturer's certifications that products comply with specified requirements and governing codes including product data, laboratory test reports and research reports showing compliance with specified standards.

C. Shop (Coordination) Drawings: Submit shop drawings for reflected ceiling plans (RCP's), drawn to scale, and coordinating penetrations and ceiling mounted items. Show the following details:

1. Reflected ceiling plan including joint patterns & details.

2. Ceiling suspension system plan with appropriate components, suggested hanger locations & details.

3. Method of attaching suspension system hangers to building structure as coordinated by installer.

4. Ceiling-mounted items including: light fixtures, air outlets and inlets, speakers, sprinklers, and other interfaces. Coordinate all appliances to be installed in ceiling system. Product selection shall be compatible with ceiling system.

5. Special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.

6. Framing and support details for work supported by ceiling suspension system.

7. List of materials, dimensions, hanger fastenings and any special details.

8. Minimum drawing scale: 1/8" = 1'-0".

9. Provide full scale drawings of perforation patterns. Provide minimum 1"=1'-0" scale layout for each panel type showing perforation layout and orientation as required.

10. Shop drawings shall originate from manufacturer. Subcontractor drawings will not be acceptable, except to show attachment to structure.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

11. Where requested by architect, provide engineered drawings with direction from consulting SE confirming design integrity to the satisfaction of specification requirement.

12. Coordinate with other work supported by, adjacent to or penetrating through the ceiling system.

D. Samples for Verification: Full-size units (or as specified below) of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics. Submit samples for each type specified.

1. 12-inch square, (acoustical) metal pan units.

2. 12-inch long samples of each exposed molding or trim.

3. 12-inch long samples of each suspension component.

E. Qualification Data: For firms and persons specified in "Quality Assurance" (Section 1.5). Provide documents to demonstrate their capabilities and experience.

F. BIM (Building Information Modeling): Provide 3-D models (as applicable) of the ceiling system including, panels, suspension and necessary components to make the system complete; compatible with "NavisWorks" or other appropriate 3-D model interfacing software.

1.5 QUALITY ASSURANCE

A. Unless accepted otherwise by the Architect, use manufacturer and installers that employ a Quality Management System complying with the program described in ISO 9001-2008, or similar system.

B. Installer

1. To certify a minimum 5 years experience installing similar systems and scope to those specified or approved in written form by “Basis of Design” manufacturer.

2. Provide list of at least 5 successful installations with similar products and scope. Include names and contact numbers of Architect and employer for reference.

C. Manufacturer

1. To certify a minimum of 5 years experience as a manufacturing enterprise engaged in sales and production of similar products to those specified.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. Provide support documentation including name and date of similar projects completed. Include names and contact numbers of Architect and employers for reference.

3. Manufacturer shall be single source, original equipment, engineering and design, and shall be the fabricator and supplier of appropriate major components. Broker / Package of components will not be acceptable.

D. Fire-Test-Response Characteristics: Provide metal ceilings that comply with the following requirements:

1. The panels are made from a non-combustible aluminum core and tested in accordance with ASTM E84. Class A (0-25 flame spread) Surface-burning characteristics of acoustical metal pan ceilings per IBC Chapter 8 Section 803.

E. Mock-Ups: Before releasing linear metal ceilings, if requested, construct mock-ups for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mock-up to comply with the following minimum requirements, using materials indicated for completed work.

1. Locate mock-ups in the location and of the size indicated or, if not indicated, as directed by the Architect. Minimum mock-up size to be 10’x 10’ unless otherwise specified.

2. Notify Architect seven days in advance of the dates and times when mock-ups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Site Coordination Mock-up:

   a. For approval of assembly, sequence of installation, coordination of trades involved, including ceiling panel types and shapes.

   b. Sized large enough to include a minimum of 2 adjacent panels Demonstrating interface work of fire protection sprinklers, lighting, mechanical diffusers, anchoring method at steel structure; adjacent vertical wall; skylight and fascia, trim and accessories.

5. Obtain Architect’s approval of mock-ups before starting construction of acoustical laminate / metal pan ceilings. Submit detailed, ACAD shop drawing illustrating extent and scope of mock-ups. Do not proceed without approval of these drawings.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

6. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.

    a. When directed, demolish and remove mock-ups from project site

    b. Approved mock-ups in an undisturbed condition at the time of initial Acceptance may become part of the completed work, subject to Architect / Employer approval.

F. Pre-installation Conference: Conduct conference at Project site as directed by the project Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical metal ceiling units and suspension system components in original, unopened packages clearly labeled with the following information: name of manufacturing source and location; product type, description and quantity; clients name and shipping address.

B. Store components in a fully enclosed space where they will be protected against physical damage from direct moisture, significant change in humidity, direct sunlight, significant change in temperature, surface contamination, and any other preventable cause.

C. Exercise care in handling components to prevent damage to the surfaces and edges and prevent distortion or other physical damage. Comply with prescribed stacking instructions to prevent damage to the components. Panel's protective layer to be removed only after installation is complete to help prevent panel surface damage.

1.7 PROJECT CONDITIONS

A. Environmental Limitations

1. Do not install acoustical metal pan ceilings until after spaces are enclosed and weather tight and after wet work and work above ceilings is complete and accepted by project Architect.

2. Maintain environmental conditions within limits recommended by manufacturer for optimum results.

    a. Maintain within a temperature range of 50-100 degrees.

    b. Maintain within a 20%-60% relative humidity.

B. Do not install products in exterior space unless the system has been specifically designed and approved for exterior application.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.8 WARRANTY

A. Provide specified manufacturer warranty against defects in workmanship.

B. This warranty shall remain in effect for a minimum period of one (1) year from date of installation.

1.9 MAINTENANCE & EXTRA MATERIALS

A. Maintenance Instructions: Provide manufacturers standard maintenance and cleaning instructions for finishes provided.

B. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Only typical system components are included with attic stock.

1. Metal Ceiling Pan Units: Full-size units equal to 1 percent (1%) of amount installed.

2. Ceiling Suspension System Components: Quantity of each grid and exposed component equal to 1 percent (1%) of amount installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of design USG Ceilings Plus - 6711 E. Washington Blvd., Los Angeles, CA 90040. 800-822-3411 – www.ceilingsplus.com.

B. Supply specified item or comply with Section 01 60 00 “Substitutions”. Specified manufacturer’s standard of quality and manufacturing tolerances shall be the criteria for evaluating “equivalent” products. Substitution shall be equal to or of better quality than the specified product in the opinion of the Architect and / or owner.

2.2 MATERIALS

A. Ceiling Type MCG - Ceilings Plus “Barz" – Perforated – as required; “White Oak Arboreal” finish or approved equal.

1. All panels are to be manufactured from single sheets of aluminum selected for surface flatness, smoothness and freedom from surface blemishes where exposed to view in a finished unit. Do not use material where the exposed surface exhibit pitting, seam marks, roller marks, stains, discolorations, or variations in flatness exceeding those permitted by referenced standards for stretcher-leveled aluminum alloy sheets.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. The individual linear members are to be die formed from a single sheet of aluminum, to dimensions as noted on drawings, with integral top return and end flanges. Each individual linear aluminum members shall be straight and square within 1/32" over 10'. Twisting or bowing of linear members is not acceptable. Objectionable deflection will not be tolerated. No indentations, marks or defacing of the exposed surface of the metal ceiling panel will be allowed. Roll forming shall not be allowed.

3. Panel material shall be primed aluminum sheet type 3105 series alloy that has up to 90% recycled content. It shall be machine stretcher-leveled and a minimum of .040" thickness, or greater if required, so that the panel deflection does not exceed L/360.

4. Individual linear members shall be factory attached to torsion spring backer supports (cassette assemblies). Each panel (cassette) assembly shall have minimum two backer supports (three backer supports for lengths greater than 60"), creating a modular panel assembly with minimum 1/4" reveals between panel ends.

5. No fasteners of any kind shall be visible on exposed face surfaces of ceilings or support tees. Down-light openings, sprinkler holes and miscellaneous penetrations shall be carefully field cut as required.

6. The Barz finish shall be:

    a. "**White Oak Arboreal**" PVC free, laminate that is permanently bonded to the aluminum sheet with formaldehyde free, water based adhesive of minimum bond strength of 425 psi @ 25 degrees C.

7. Linear member size shall be 1"wide x 3" deep, spacing shall be 3" between Barz per architectural drawings.

8. Panel sizes are 12" x 96" or sized as per architectural drawings.

9. End Profile: Linear Barz end joints are reveal condition unless specified otherwise integral enclosures. Linear members shall have integral ends in single piece. Exposed end shall have closure.

10. Barz to be non-perforated unless otherwise noted.

11. Sound-Absorptive Fabric Layer: Provide manufacturer's acoustic fabric sized to fit and laminated to concealed surface of panel. Material shall be both non-flammable and sound-absorptive.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

a. Fire Class shall be Class A, with surface-burning characteristics for flame-spread rating of 25 or less and smoke developed rating of 50 or less. Provide independent accredited lab test results showing compliance with Class A rating as per ASTM E84.

b. Achieve absorption value up to .95 NRC. Provide independent accredited laboratory test results illustrating compliance with acoustical requirements as per ASTM C423.

c. Provide recycled cotton, “Ultrasorb” in sufficient thickness to achieve up to 0.95 NRC rating specified.

d. Install acoustical pads to fit the cavity of the linear members, unless otherwise directed by the Architect.

12. The plenum shall be 100% accessible. Every cassette must be removable. Progressive panel access is not acceptable. Heavy duty torsion springs and steel clip assemblies to be mounted to every cassette for downward access, without potential for damage to cassette face or hinge assembly. Hinge assembly shall be mounted to every cassette with minimum two flush to face, counter sunk chamfered fasteners. Attaching torsion spring directly to cassette with fastener will not be acceptable.

13. All Barz with visual exposure where row terminates shall have integral end returns.

14. Provide and install matching finish trim on each side of each suspended area (or as specified).

2.3 METAL SUSPENSION SYSTEMS. GENERAL

A. Metal Suspension Standard: Provide panel manufacturer's metal suspension systems of types, structural classifications, materials, and finishes indicated that comply with applicable ASTM C635 requirements.

1. Main and cross runners to be specified manufactures Standard “Heavy Duty” tee bar (as per ASTM C635).

2. Face of main and cross runners to be factory finished matte black unless known otherwise.

3. Face of main runners to be factory slotted to receive torsion springs.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

4. Provide suspension system made from steel sheet with an average recycled content such that post-consumer recycled content plus one half or pre consumer content is not less than 25 percent.

B. Suspension Systems: Provide complete suspensions systems with main runners, cross runners, hangers, trim molding, seismic retention clips, load resisting struts and other suspension components required to support ceiling and other ceiling supported construction (some of these parts may be supplied by the installer).

C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, "Direct-Hung", unless otherwise indicated (supplied by installer)

1. Provide anchor, for use in the particular application

2. Structural substrate, as indicated to support attachment device.

3. Anchors specified must provide corrosion resistance as per metal type and application.

a. Anchors into Concrete (with or without steel deck)

i. Pre-installed – Cast in Place Anchors
ii. Post-installed - Expansion Anchors
iii. Post-installed – Chemical Anchors
iv. Post-installed – Powder Actuated Fasteners

b. Anchors into Wood

i. 1/4" min diameter with 1-1/4" minimum penetration

c. Anchors into Steel

i. Clip or Clamp
ii. Shot Pin

d. Anchors into Steel Deck: This option requires special attention from both the "Structural Engineer of record" and the Professional Engineered retained to provide structural documents in order to coordinate detailing required to provide anchoring device.

4. "Direct-Hung" Suspensions Systems: System composed of main runners supported by hangers attached directly to building structure.

5. "Indirect-Hung" Suspension Systems: System composed of main runners connected to carrying channels that are attached by hangers to building structure, and complying with the following requirements:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

a. Hangers: Type and metal standard with ceiling system manufacturer, sized to comply with structural classification indicated.

b. Wire Hangers, where applicable, Braces, and Ties: Provide wires complying with the following requirements:

i. Zinc-Coated Carbon-Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.

ii. Size: Select wire diameter so its stress at three times hanger design load (ASTM C635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 2mm diameter wire.

iii. Extruded Aluminum members shall comply with ASTM B209

c. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint, 'Black" finish.

d. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint, 'Black" finish.

e. Angle Hangers: Angles with legs not less than 22mm wide, formed with 1mm thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation, with bolted connections.

2.4 FINISHES, GENERAL

A. Comply with "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturers standard factory-applied finish for type of system indicated unless specified otherwise.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of finished work: Painted, 'Black" finish:

1. Noticeable variation in same piece is not acceptable.

PART 3- EXECUTION

3.1 EXAMINATION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

A. Examine substrates and structural framing to which acoustical metal panels attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect installation and anchorage, and other conditions affecting performance of metal panel ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Measure each ceiling area and establish layout of acoustical metal pan units to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.

C. Survey substrate for wall attachment to assure squareness and proper elevation for wall panel installation.

3.3 INSTALLATION

A. General: Install linear Barz metal pan ceilings, per manufacturers shop drawings provided, per manufacturer's written instructions and to comply with publications referenced below.

1. ClSCA "Ceiling Systems Handbook.

2. Standard for Ceiling Suspension System Installations - ASTM C636.

3. Standard for Ceiling Suspension Systems Requiring Seismic Restraint - ASTM E580

4. IBC (International Building Code) standard for Seismic Zone for local area.

B. Suspend ceiling hangers from building's approved structural substrates and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produce hanger spacings that interfere with location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

4. Where used secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Space hangers not more than 48 inches on center, along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches from ends of each member.

6. Fine level grid to 1/8 inch in 10 feet from specified elevation(s), square and true.

7. Adjust suspension system runners so they are square (within .5 degree from 90 degrees) and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

C. Secure bracing wires to ceiling suspension members and to supports acceptable to Architect / Engineer and or inspector. Suspend bracing from building's structural members and / or structural deck, as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs(unless directed otherwise).

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical metal pan. Method of edge trim attachment and design of edge trims to be approved by Architect.

1. Screw attach moldings to substrate at intervals not more than 18” O.C. and not more than 6” from ends, leveling with ceding suspension system to a tolerance of 1/8” in 10’. Miter corners accurately and connect securely.

2. Do not use exposed fasteners, including pop rivets, on moldings and trim without prior written approval or unless detailed otherwise.

E. Scribe and cut linear Barz metal panel units for accurate fit at penetrations by, other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

F. Install linear Barz metal panel units in coordination with suspension system.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions, unless otherwise indicated. Install directionally patterned or textured panels in directions indicated on approved shop drawings. Panel-joints shall flow smoothly and in a straight line within 1/8” in 10’. Intersections shall be continuous.

2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.

3. Remove panels from protective packaging only when space is completely clean and free of airborne particles. Use white cotton gloves for final installation of panels into grid system.

3.4 ADJUSTING AND CLEANING

A. Adjust ceiling components to provide a consistent finish and appearance in conformity with established tolerances and requirements.

B. Clean exposed surfaces of acoustical metal panel ceilings and walls. Comply with manufacturer's written instructions for cleaning and touch-up of minor finish damage.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

End of section

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 09 6513

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1. SUMMARY

A. Resilient base at carpet and concrete flooring finishes, and resilient carpet transition.

1.2. RELATED SECTIONS

A. Section 03 3000 – Cast-in-Place Concrete.

B. Section 09 2116 – Gypsum Board Assemblies.

C. Section 09 6800 – Carpet Tile.

1.3. REGULATORY REQUIREMENTS

A. Conform to applicable code for flame/fuel/smoke rating requirements of ASTM E84.

B. 40 CFR 247 Comprehensive Procurement Guidelines for Products Containing Recovered Materials.

1.4. ENVIRONMENTAL REQUIREMENTS

A. Store materials in area of installation for three days prior to installation to achieve temperature stability.

B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

1.5. SUBMITTALS

A. Submit the following in accordance with Section 01 3300 – Submittal Procedures:

1. Product data for approval of the resilient base.
2. Manufacturer’s installation instructions.
3. Cleaning and maintenance information.
4. Certification that recovered (recycled) materials is 90 to 100 percent per 40 CFR 247 requirements.
5. Manufacturer’s certification of asbestos-free products for all products including adhesives and mastics.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS - BASE & TRANSITION MATERIALS

A. Johnsonite.

B. Burke Flooring Products.

C. Flexco Company.

D. Roppe.

E. Gateway.

2.2. PRODUCT OPTIONS AND SUBSTITUTIONS

A. Comply with Section 01 6300 – Product Substitution Procedures.

2.3. BASE MATERIALS

A. Vinyl; provide roll stock for distances greater than 4 feet, 4 and/or 6 inches high; 1/8 inch thick; top set coved; colors to be selected by Architect from manufacturer’s standard samples; refer to Drawings for locations.

B. Johnsonite; MW-XX-F6 Millwork Wallbase Reveal; 6 inches high; 1/4 inch thick; color to be selected by Architect from manufacturer’s standard samples; refer to Drawings for locations.

2.4. ACCESSORIES

A. Provide primers and adhesives that are waterproof, and of type recommended by manufacturer.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Do not begin installation and notify the Contract Administrator if substrate conditions will adversely affect acceptable results.

3.2. INSTALLATION - BASE MATERIAL

A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.

B. Miter internal corners. At external corners, "V" cut back of base strip to 2/3 of its thickness and fold.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Install base on solid backing. Bond tight to wall and floor surfaces.

1. LANL Project I.D. [ ] Resilient Base and Accessories
2. Rev. 0, January 6, 2006 09 6513-3

D. Scribe and fit to door frames and other interruptions.

3.3. CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage to those surfaces.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 09 8400

ACOUSTICAL ROOM COMPONENTS

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Absorbers.

1.2. RELATED SECTIONS

A. Section 09 2116 – Gypsum Board Assemblies.

1.3. REFERENCES

A. ASTM C423-81a, Sound Absorption and Sound Absorption Coefficients by the Reverberation Method.

B. ASTM E-84-81a, Surface Burning Characteristics of Building Materials.

1.4. SUBMITTALS

A. Submit under provisions of Section 01 3300 – Submittal Procedures.

B. Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Where custom sized panels are indicated on the drawings, submit shop drawings with a minimum 1/4 inch scale wall elevations and appropriate details indicating field dimensions, panel layout, and installation methods.

D. LEED Submittals: Provide documentation of how the requirements of Credit will be met:

1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
2. Certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.

E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

F. Customers' Own Material (COM): For each panel covering material required, submit 1 linear yard (914 mm) material to panel manufacturer to determine compatibility with specified panel prior to confirmation of order.

G. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5. QUALITY ASSURANCE

A. Manufacturer Qualifications: A company that specializes in the manufacturing of the custom acoustical products required for the project. Minimum of five years of custom acoustical product manufacturing experience.

B. Installer Qualifications: Contractor that has installed custom acoustical products and is recommended by the manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Acclimate materials to installation conditions for seventy-two hours prior to installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7. PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Do not install acoustical wall until ambient temperature and humidity level will be continuously maintained at conditions indicated for Owner occupancy.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Acceptable Manufacturer: Quiet Technology Systems, located at: 255 N. Pasadena Street; Gilbert, Arizona 85233; Tel: 480-632-9234; Fax: 480-632-9238; Email:accusound@hotmail.com; Web: www.qtechsys.com

B. Creative Materials for Acoustics, which is located at: 205 Ead Road Shorewood,lL 60434 Email: cmainc@cmainc.net Web:www.cmainc.net Toll Free: 866.730.9750 Tel: 815.730.9750 Fax: 815.730.9752

C. Pinta Acoustic: 2601 49th Avenue North Suite 400 Minneapolis, MN 55430 Email: sales@pinta-acoustic.com Web:www.pinta-acoustic.com Toll Free: 800.662.0032

D. Or Equal.

2.2. MATERIALS

A. Absorbers

1. Basic Series Acoustical Panels: Constructed of a single core of dimensionally stable glass fiber of medium density (6-7 PCF).

   Location: All Ceiling locations

   a. Panel Size (Nominal): 48 inches by 144 inches
   b. Core thickness: 2 1/8 inches
   c. Edge treatment: Chemically hardened
   d. Edge profile: Square.
   e. Mounting: Z-clip at ceiling locations
   f. Finish: Guilford FR701 2100 Series Fabric selected from manufacturer's standard colors and patterns Finish shall be applied directly to the face and edges of the panel and returned to the back of the panel to provide a full finish edge. All corners to be fully tailored.
   g. Acoustical performance: Minimum Noise Reduction Coefficient (NRC) of 1.0-1.05. In accordance with ASTM C 423.
   h. Flammability: All panel components shall have a Class A rating (0-25) Flame Spread per ASTM E 84.

2. Impact Resistant/Tackable Series Acoustical Wall Panels: Constructed of a single core of dimensionally stable rigid fiberglass of medium density (6-7 PCF) laminated to a 1/8 inch (3 mm) thick high density (16-20 PCF), smooth, tackable and impact resistant fiberglass face.

   Locations: Wall locations per Elevations

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

a. Panel Size (Nominal): 36 inches by 120 inches
b. Overall Core thickness: 1/8 inch plus 1 inch (54 mm)
c. Edge treatment: Chemically hardened.
d. Edge profile: Square.
e. Corner detail: Square.
f. Mounting: Impaling clips and adhesive. 7/8 to 2plus1/8 inch (22 mm to 54 mm) panel thickness only or Roto-Fast Fastner.
g. Finish: Guilford FR701 2100 Series Fabric selected from manufacturer's standard colors and patterns. Finish shall be applied directly to the face and edges of the panel and returned to the back of the panel to provide a full finish edge. All corners to be fully tailored. (Square Corners are required for Vinyl Finish).
h. Acoustical performance: Minimum Noise Reduction Coefficient (NRC) of 0.95-1.0. In accordance with ASTM C 423.
i. Flammability: All panel components shall have a Class A rating (0-25) Flame Spread per ASTM E 84.

3. 24” x 48” x 2” thick Sonex Jr panel by Pinta Acoustic. Natural grey color.

2.3. ACCESSORIES

A. Supplemental Fasteners: Types recommended by panel manufacturer to suit panel installation application.

B. Adhesive: Type recommended by panel manufacturer.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify substrate is flat, plumb and level and ready to receive the work of this section.

C. Verify adjacent and related work is complete. Building shall be properly enclosed and under standard occupancy conditions (temperature of 60-85 degrees Fahrenheit and not more than 80 percent relative humidity) before beginning installation.

D. Verify that any wall blocking required to receive Quadratic Diffuser frame attachment is installed and properly located.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

F. Site Verification of Conditions:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Examine surfaces scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities and dampness that would affect quality and execution of work.
2. Do not proceed with installation of wall panel system until unacceptable conditions are corrected.

3.2. PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure framework to substrate with adhesive and/or fasteners in accordance with manufacturers instructions.

3.4. CLEANING

A. Clean exposed surfaces of acoustical panel, trim, moldings and suspension members to comply with manufacturer's instructions for cleaning.

B. Touch up any minor finish damage.

C. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5. PROTECTION

A. Protect installed products until completion of project.

B. Clean exposed fabric faces, repair or replace damaged products before Substantial Completion.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 09 9100

PAINTS AND COATINGS

PART 1 - GENERAL

1.1. SUMMARY

A. Surface preparation and field application of paints and coatings, as indicated on Drawings and specified herein.

1.2. DEFINITIONS

A. Paint: As used herein, means coating system materials, including primers, emulsions, epoxy, enamels, stains, sealers, fillers, and other applied materials, whether used as primer, intermediate, or finished coats.

1.3. REFERENCES

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Master Painters and Decorators Association; 2002.

1.4. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

1.5. QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing quality paint and finish products as specified in this Section with minimum 5 years documented experience.
2. Applicator: Company specializing in commercial painting and finishing products as specified in this Section with minimum 5 years documented experience.

B. Regulatory Requirements:

1. Fire Performance Characteristics: Tested per ASTM E84

    a. Flame spread: 25 or less.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

b. Smoke Developed: 450 or less.

C. Paint Coordination:

1. Provide finish coats that are compatible with prime coats actually used.
2. Review other Sections of these Specifications as required, verifying prime coats to be used, and assuring compatibility of total coating system for various substrata.
3. Upon request by Architect, provide information on characteristics of specific finish materials to assure that compatible prime coats are used.
4. Provide barrier coats over non-compatible primers, or remove primer and re-prime as required.
5. Notify Architect in writing of anticipated problems in using specified coating systems over prime coatings supplied under other Sections.
6. When painting over top of existing paint, analyze existing paint for type and composition to determine exact preparation and primer to be used with new paint product specified.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 6000 – Product Requirements.

B. Deliver products to site in sealed and labeled containers. Inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

F. Provide lighting level of minimum 80 foot-candles measured mid-height of substrate surface.

1.7. PROJECT CONDITIONS

A. Environmental Requirements:

1. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
2. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instruction.
3. Minimum application temperatures: Unless required otherwise by manufacturer's instructions, meet the following temperature requirements for finish applications:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

a. Latex: 45 degrees F for interiors; 50 degrees F for exterior.
b. Varnish: 65 degrees F for interior or exterior.

1.8. MAINTENANCE

A. Extra Materials: Provide extra materials per Section 01 7800 – Closeout Submittals.

1. Upon completion of Work of this Section, deliver to Owner an extra stock equaling 10 percent of each type, color, and gloss of paint used in Work, in new, unopened, tightly sealed containers, clearly labeled with contents and locations where used.
2. Store in Owner's designated storage area.

B. Maintenance Data: Provide manufacturer's complete maintenance data per Section 01 7800 – Closeout Submittals.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Dunn Edwards Paints.

B. ICI Dulux Paint Stores (Dulux Paint).

C. Sherwin-Williams Company.

D. Other manufacturers listed in MPI Approved Products List under applicable MPI product reference number unless otherwise noted.

E. Substitutions: Conform to Section 01 6300 – Product Substitution Procedures.

2.2. MATERIALS

A. Refer to Finish Schedule for products required of this Section.

B. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer, based on testing and field experience.

C. Material Quality: Paint material containers not displaying paint manufacturer's product identification will not be accepted.

D. Proprietary Names: Use of specified manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers, unless noted by the phrase "No Substitutions" or a similar phrase. Provide manufacturer's material data

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

and certificates of performance for proposed substitutions.

E. Undercoats and Thinners:

1. Provide undercoat paint produced by same manufacturer as finish coat.
2. Use only thinners recommended by paint manufacturer, and use only to recommended limits.
3. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.

F. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

1. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

G. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners, and other materials not specifically indicated but required to achieve finishes specified, of commercial quality.

H. Conform to Federal, State, and Local Regulations, including VOC/VOS rules at time of application.

2.3. FINISHES

A. Refer to Finish Schedule.

2.4. APPLICATION EQUIPMENT

A. For application of approved paint, use only such equipment as is recommended for application of particular paint by manufacturer of particular paint, and as approved by Architect.

B. Prior to use of application equipment, verify that proposed equipment is actually compatible with material to be applied, and that integrity of finish wall will not be jeopardized by use of proposed equipment.

2.5. OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by Contractor and subject to approval of Architect.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of Work. Report conditions that may potentially affect proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Veneer Plaster and Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
3. Interior Wood: 15 percent, measured per ASTM D2016.

F. Review other Sections in which primers are provided to ensure compatibility of total system for various substrates. At request of Architect, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems using materials specified over substrates primed by others.

3.2. MATERIALS PREPARATION

A. General:

1. Mix and prepare paint materials per manufacturer's recommendations as approved by Architect.
2. When materials are not in use, store in tightly covered container.
3. Maintain containers used in storage, mixing, and application of paint in a clean condition, free from foreign materials and residue.

B. Stirring:

1. Stir materials before application, producing a mixture of uniform density.
2. Do not stir into material films that may form on surface, but remove film and, if necessary, strain material before using.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.3. SURFACE PREPARATION

A. Exterior and Interior Surfaces - New construction and previously painted surfaces:

1. Follow recommended procedures outlined by paint manufacturer for surface preparation of applicable specified surfaces and substrates.

B. Existing Surfaces: Prepare previously painted surfaces for painting by methods recommended by paint manufacturer or by standard trade practices. Perform Work on these existing surfaces to have a finish quality the same as on new Work.

1. Remove blistered, peeling, and scaling paint to a sound substrate.
2. Remove heavy chalk by scrubbing with soap and water.
3. Sand glossy areas and dust clean.
4. Clean and spot prime failed areas.
5. Prime non-compatible substrates with an appropriate high quality primer.
6. Use soap and water on areas such as eaves and ceilings to remove invisible residues. Rinse clean and let dry.
7. Completely kill and remove existing mildew surfaces before applying paint.
8. Remove efflorescence from masonry surfaces.
9. Thoroughly clean by hand or power tools rusted or abraded area on painted metal. In corrosive areas, abrasive-blast clean these surfaces.
10. If these measures do not result in good paint adhesion, completely remove paint from existing surfaces and repaint with new material.

C. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Correct defects and clean surfaces that affect Work of this Section. Remove existing coatings that exhibit loose surface defects.

E. Seal with shellac and seal marks that may bleed through surface finishes.

F. Impervious Surfaces:

1. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach.
2. Rinse with clean water and allow surface to dry.

G. Copper Surfaces Scheduled for a Paint Finish: Remove contamination by steam, high pressure water, or solvent washing.

3.4. PROTECTION

A. Protect elements surrounding Work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by Work of this Section.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site on a daily basis.

3.5. PAINT APPLICATION

A. General:

1. Apply paint coatings per manufacturers' written instructions and recommendations. Use applicators and techniques best suited for substrate and type of materials being applied.
2. Touch-up shop applied prime coats that have been damaged, and touch-up bare areas prior to start of finish coat application.
3. Slightly vary the color of succeeding coats.

    a. Do not apply additional coats until completed coat has been inspected and approved by Architect.
    b. Only the inspected and approved coats of paint will be considered in determining number of coats applied.

4. Sand and dust between coats to remove defects visible to unaided eye from distance of 5 feet.
5. On removable panels and hinged panels, paint back sides to match exposed sides.

B. Drying:

1. Allow sufficient drying time between coats, modifying period as recommended by material manufacturer to suit adverse weather conditions.
2. Consider oil-base and oleo-resinous solvent type paint as dry for re-coating when paint feels firm, does not deform or feel sticky under moderate pressure of thumb, and when application of another coat of paint does not cause lifting or loss of adhesion of undercoat.

C. Brush Applications:

1. Brush out and Work the brush coats onto surface in an even film.
2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.

D. Spray Applications:

1. Except as specifically otherwise approved in writing by Architect, confine spray application to metal framework and similar surfaces where hand brush Work would be inferior.
2. Where spray application is used, apply each coat to provide hiding equivalent of brush coats.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3. Do not double back with spray equipment to build up film thickness of 2 coats in 1 pass.

E. For completed Work, match approved samples as to texture, color, and coverage. Remove, refinish, or repaint Work not per specified requirements.

F. Miscellaneous Surfaces and Procedures:

1. Exposed Mechanical Items:

a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, and items of similar nature to match adjacent wall and ceiling surfaces, or as directed by Architect.
b. Paint visible duct surfaces behind vents, registers, and grilles "Flat Black".
c. Wash metals with solvent, prime, and apply 2 coats of alkyd enamel.

2. Exposed Pipe and Duct Insulation:

a. Apply 1 coat of latex paint on insulation that has been sized or primed under other Sections; apply 2 coats on such surfaces when unprepared.
b. Match color of adjacent surfaces.
c. Remove band before painting, and replace after painting.

3. Hardware:

a. Paint prime coated hardware to match adjacent surfaces.
b. Paint metal portions of head seals, jamb seals, and astragal seals to match color of the door frame unless otherwise directed by Architect.

4. Wet Areas:

a. In toilet rooms and contiguous areas, add an approved fungicide to paints.

G. Prep, prime, and finish paint exposed interior steel and concrete surfaces in areas of new construction.

H. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Architectural woodwork and casework.
b. Acoustical wall panels.
c. Metal toilet enclosures.
d. Metal lockers.
e. Unit kitchens.
f. Elevator entrance doors and frames.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

g. Elevator equipment.
h. Finished mechanical and electrical equipment.
i. Light fixtures.
j. Distribution cabinets.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Foundation spaces.
b. Furred areas.
c. Ceiling plenums.
d. Utility tunnels.
e. Pipe spaces.
f. Duct shafts.
g. Elevator shafts.

3. Finished metal surfaces include the following:

a. Anodized aluminum.
b. Stainless steel.
c. Chromium plate.
d. Copper.
e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.
b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.

5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

3.6. CLEANING

A. Comply with Section 01 7000 – Execution Requirements.

B. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

C. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

D. Collect cotton waste, cloths, and material that may constitute a fire hazard, place in closed metal containers and remove daily from site.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

E. Upon completion of Project, remove surplus materials, scaffolds, etc. that relate to Work of this Section, from the premises. Clean window glass free of excess paint and splatters, and remove paint that has been misplaced on other surfaces.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 10 1400

INTERIOR SIGNAGE

PART 1 - GENERAL

1.1. SUMMARY

A. Interior signage.

B. Anchorage, accessories and fasteners for signage.

1.2. RELATED SECTIONS:

A. Section 09 2116 – Gypsum Board Assemblies.

1.3. REFERENCES

A. AA: Architectural Aluminum.

B. AAMA: Architectural Aluminum Manufacturers Association.

C. AMP: Architectural Metal Products (Division of NAAMM).

D. ASTM A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

E. ASTM B 108 - Standard Specification for Aluminum-Alloy Permanent Mold Castings.

F. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

G. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

H. ASTM B 584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

I. NAAMM: The National Association of Architectural Metal Manufacturers.

1.4. SYSTEM DESCRIPTION

A. Provide room identification and directional signage as required by the Drawings, Schedules, or as required by governing codes and regulations.

B. Interior Code Mandated Signage: Provide signage as required by accessibility regulations

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

and requirements of authorities having jurisdiction. These include, but are not limited to, the following:

1. Fire Doors.
2. Room Capacity.
3. Signs for Accessible Spaces.
4. Room Names.
5. Exit Doors.

1.5. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Shop Drawings: Indicate sign styles, lettering, locations, and overall dimensions of each sign.

1. Computerized Output: Furnish computerized samples of applied copy signs and graphics at full scale duplicating final appearance.

C. Product Data: Furnish manufacturer's literature; indicate each sign type, style, color and method of attachment.

D. Samples: Full size Samples illustrating sign type, style, and color specified including method of attachment.

E. Manufacturer's written installation instructions.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 6000 – Product Requirements.

B. Package signs, labeled in name groups.

C. Store adhesive tape at ambient room temperatures.

1.7. QUALITY ASSURANCE

A. Comply with Section 01 4000 – Quality Requirements.

B. Regulatory Requirements:

1. Comply with requirements of the Americans with Disabilities Act (ADA) for interior directional and way-finding signs

C. Signage supplier and installer shall be responsible for design, layout, and location of sign systems as it relates to compliance with local fire and life safety codes.

D. The fabricator and installer of each type of sign shall be experienced in this type of work.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

Sign fabrication and installation shall be their primary business.

E. Each type of signage shall be fabricated and installed by one firm as a single source responsibility.

1.8. PROJECT CONDITIONS

A. Comply with section 01 6000 – Product Requirements.

B. Environmental Requirements:

1. Do not install interior plastic signs until ambient conditioned spaces are maintained at a temperature of at least 70 degrees F. Maintain this minimum temperature during and after installation of signs.

1.9. WARRANTY

A. Warranty: Warrant materials and workmanship against defects after completion and final acceptance of the Work for period of five years.

1. Repair defects from faulty materials or workmanship developed during the correction period, or replace with new materials, at no expense to Owner.
2. Warrant factory applied painted finishes against chip, peel, crack and fade.
3. Delaminating of any part of the signs or sign face lettering.
4. Cupping, warping, or dishing of sign panel face.
5. Bubbling, crazing, chalking, or rusting or other deterioration of the sign face or of the message or of the edge finish of the paint.
6. Corrosion developing beneath paint surfaces or the support systems.
7. Corrosion of fasteners.
8. Movement of the signs from their foundation or support. The signs shall remain true and plumb on the support.

B. Warrant that sign installation complies with local governing codes and A.D.A. requirements.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Signage shall be proprietary as manufactured by one of the following approved manufacturers with the materials specified herein and on the Drawings:

1. Approved local signage shop.
2. Advance Corp., Braille-Tac Div.
3. Advance Printing Products.
4. Allenite Architectural Signs Systems.
5. APCO Graphics.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

6. Best Mfg. Sign Systems.

2.2. MATERIALS

A. Cast acrylic sheets complying with ASTM D4802.

B. Color: Black

2.3. PANEL SIGNS

A. Panel signs shall be fabricated from the materials noted herein.

B. Signs with engraved copy:

1. At opaque acrylic signs, engrave the face of the sheet with the required lettering and images and fill with enamel paint in the approved color.

C. Each sign shall include the lettering and images in the font, style and size as noted on the reviewed shop drawings.

D. Signs shall be fabricated with precise tooling free of burrs, scratches, and other defects.

E. Signs shall be fabricated as per the details on the Drawings, reviewed shop drawings, and/or approved mock ups.

F. Ensure that sign fabrication complies with all local codes and A.D.A. requirements.

G. Lettering and numbering shall be fastened with concealed fasteners unless specifically detailed otherwise.

H. There shall be no visible labels, manufacturer's or otherwise, code permitting, on the completed signs. If labels are required, a sample label and intended location must be submitted for Designer review, prior to application

2.4. ACCESSORIES

A. Anchors for signage shall be non-corrosive anchors or inserts designed to accommodate the fastening requirements of the signage being installed.

B. Provide anchors that are to be installed into concrete or masonry.

C. Fasteners shall be non-corrosive and shall be compatible with the metal of the sign and the substrate.

D. Where signs are attached with adhesives or tape, ensure that the sign and substrate are compatible with these materials.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Do not proceed until unsatisfactory conditions are corrected.

B. Coordinate work of this section with work of other sections in order that adjacent and adjoining work do not prevent proper installation.

C. Prior to installation of finish wall surfaces, verify that blocking type and location for signage is in place.

D. Coordinate structural support with signage shop drawings. Provide attachment templates for structural fabrication and installation.

E. Beginning of installation means installer accepts existing surfaces.

3.2. INSTALLATION

A. Install identifying devices per manufacturer's instructions free from distortions and defects.

B. Locate interior identification signs on wall surface at strike side of door where space is available, see Drawings.

C. Install centered and level, in line, in accordance with the manufacturer's recommendations.

D. Clean and polish, remove excess adhesive.

E. Install a blank plate backing to conceal adhesive when mounting to glass surfaces.

F. ADAAG Toilet Room Signs: Install signs on walls after surfaces on which they are to be mounted are painted and finished.

1. Location: Mount signs centered at 60" above finished floor on strike side of door.
2. Install level, in line, in accordance with the manufacturer's recommendations and ADAAG requirements to allow a person to approach within 3" of signs without being within a door swing.
3. Clean and polish, remove excess adhesive.

G. Braille Exit Door Signs: Install at doors with lighted "EXIT" signs; apply after walls are finished.

1. Location: Mount signs centered at 60" above finished floor on strike side of door.
2. Install level, in line, in accordance with the manufacturer's recommendations and ADAAG requirements to allow a person to approach within 3" of signs without

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

being within a door swing.
3. Clean and polish, remove excess adhesive.

H. Room Identification and Direction Signs: Install signs after walls are finished.

1. Location: Mount signs centered at 60" above finished floor on strike side of door for room identification signs, where indicated for direction signs.
2. Install signs level, in line, in accordance with the manufacturer's recommendations and ADAAG requirements.
3. Install room identification signs at doors to allow a person to approach within 3" of signs without being within a door swing.
4. Clean and polish, remove excess adhesive.

I. Install identification signs level and secure to substrate.

J. Install cast metal letters with specified fastening method, and per manufacturer's instructions.

3.3. CLEANING

A. Clean Work per Section 01 7700 – Closeout Procedures.

B. Clean and polish finished surfaces.

3.4. SCHEDULE

A. Sign Item Number: Room Designation Signs

1. Location of Sign: Interior Signage
2. Type of Sign: Room Numbers
3. Style of Sign: Interior plastic panel sign with engraved lettering
4. Color of Plastic Signs: Black

B. Room names and correlating room numbers:

Per Floor plan – include in submittal for review

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 10 1419

DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1. SCOPE

A. Furnish letters and hardware necessary to install cast letters shown on drawings and herein specified.

1.2. RELATED SECTIONS

A. 04 1100 – Unit Masonry Assemblies

1.3. QUALITY ASSURANCE

A. Single Source Responsibility: Furnish products from one manufacturer for entire project.

B. Obtain all technical information from the manufacturer.

C. Manufacturer to have a minimum of 20 years experience in manufacturing letters.

D. Installer shall visit the site to gather all information on existing site conditions.

1.4. SUBMITTALS

A. Product Data: Submit manufacturer’s descriptive literature and product specifications for each product including catalogs, installation instructions and other descriptive material.

B. Provide Warranty on material and installation.

C. Provide samples letters and finishes for architects approval.

D. Provide statement by official indicating that they are a certified installation company.

1.5. PRODUCT HANDLING

A. Protect signage from damage before, during and after the installation.

1.6. PROJECT CONDITIONS

A. Coordination: Furnish samples of system(s) so installation can be coordinated with existing conditions and within onsite conditions.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Visit site and field measure prior to fabrication and delivery of materials.

1.7. WARRANTY

A. Letters should be guaranteed for the life of the business against defects.

PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Gemini Incorporated
103 Mensing Way
Cannon Falls, MN 55009
Phone: 800-538-8377 or 507-263-3957
Fax: 800-421-1256 or 507-263-4887
Email: sales@signletters.com
Web: www.signletters.com

B. Approved equal.

2.2. PRODUCT DESCRIPTION

A. Letters shall be made of cast metal.

B. Letter shall be ROFFE letter-style, see interior elevations for size and layout.

C. Refer to Elevations on Drawings for mounting locations and dimensions. A mounting template designating stud locations is required for mounting on a concrete block surface.

2.3. MATERIALS

A. Aluminum

2.4. FINISHES

A. Clear Anodized, sanded return, #514 aluminum alloy.

2.5. MOUNTING HARDWARE

A. Cast metal letters have threaded stud bosses for stud insertion.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

A. Examine the installation area and note any detrimental or hazardous work conditions. Notify contracting officer or inspector of the detrimental work conditions.

B. Do not proceed with installation until conditions are corrected.

3.2. SURFACE PREPARATION

A. Surface should be thoroughly cleaned and free of debris before installation.

B. Remove or repair articles that may damage letters after installation, including loose parts on the structure.

3.3. INSTALLATION

A. Install letters as recommended by the manufacturer.

B. A qualified installer shall install cast letters.

3.4. INSPECTION

A. Visually inspect cast letters for any signs of poor installation, including loose screws, fasteners and unremoved debris.

B. Immediately correct and repair as necessary.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 10 2113 METAL TOILET COMPARTMENTS

PART 1- GENERAL

1.1 SUMMARY

A. Metal Toilet Compartments: Floor mounted and overhead braced

1.2 RELATED SECTIONS

A. Section 05 5000 - Metal Fabrications.

B. Section 09 2116 - Gypsum Board Assemblies.

1.3 REFERENCES

A. ADA (Americans with Disabilities Act) - Requirements for Safety Standards for Making Buildings and Facilities Accessible To and Usable By Physically Disabled Persons.

B. ASTM A167 - Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

1.4 SUBMITTALS

A. Comply with Section 01 3300.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of ceiling and wall supports, and door swings.

C. Product Data: Manufacturer's data on panel construction, hardware, and accessories.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Comply with Section 01 4300.

B. Regulatory Requirements:
1. Conform to ADA requirements for access for the disabled.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.6 WARRANTY

A. Provide 1 year manufacturer's written warranty per Section 01 7836.

B. Warranty: Warrant materials and workmanship against defects after completion and final acceptance of Work.
1. Repair defects from faulty materials or workmanship developed during the guarantee period, or replace with new materials, at no expense to Owner.

PART 2- PRODUCTS

2.1 MANUFACTURERS

B. Subject to compliance with requirements, provide products from 1 of the following manufacturers:
1. Global Partitions Corporation.
2. American Sanitary Partition Corporation.
3. General Partitions Manufacturing Corporation.
4. Accurate Partition Corporation.
5. Sanymetal Partitions Corporation.
6. Substitutions: Comply with Section 01 2513.

2.2 MATERIALS

A. Steel.
1. Panels over 48 inches: Minimum 20 gauge.
2. Panels 48 inches wide and smaller: Minimum 22 gauge.
3. Stiles and pilasters: Minimum 18 gauge.
4. Headrail: 6063-T5 aluminum etched and anodized.

2.3 CONSTRUCTION

A. Stiles, Panels, and Doors: Veneer steel construction. Laminate under pressure to a honeycomb core of correct dimension
1. Unit thickness:
a. Stiles: Not less than 1-1/4 inches thick.
b. Panel and Door units: Not less than 1 inch thick.
c. Pilasters: Minimum 1-1/4 inches thick.
2. Door and Panel Sizes:
a. Door Width: 24 inches (typical).
b. Door Width for Handicapped Use: 36 inch
c. Height: 58 inches.
3. Form edges of stile, panel, and door sheets to interlock with each other, producing a rigid,

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2-piece unit.
a. Weld corners and ground smooth.

Reinforce internally stile, panel; and door units and pre-pierce for application of fittings and hardware. Attach panels to stiles with 3 concealed tension cleats.

2.4 ACCESSORIES

A. Fittings: Cast alloy, non-ferrous metal, chromium plated, and adjustable to keep stiles and panels clear from walls.
1. Stile cover bases: No. 302 stainless steel, 3 inches high.

B. Hardware: Equip doors with trouble-proof hinge set. Through-bolt type except for coat hooks. Provide one-way type theft proof screws and fasteners hardware.
1. Hinge sets: Cast alloy, non-ferrous metal, and chrome plated hinge brackets. Recess top pivot into edge of the door 2-1/2 inches below top. Anchor heavy stainless steel pin operating in a Zytel nylon bearing above and below top hinge bracket.
2. Door Operation: Control by lower hinge unit that consists of a heavy steel pintle and mating Zytel nylon cams that permit setting of door at desired position when door is not latched.
3. Slide latch, combination bumper and keeper, and coat hooks.

C. Provide door strike and keeper with rubber bumpers. Provide door pull for handicap outswinging doors.

D. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile in manufacturer's standard finish. Secure to ceiling as well as floor and wall.

2.5 FABRICATION

A. Fabricate partitions per manufacturer's standard details complying with ADA requirements.

2.6 FINISHING

A. Mechanically clean units by means of automatic vapor degreasing.

B. Finish, to be selected from manufacturer's standard selections.

PART 3- EXECUTION

3.1 EXAMINATION

D. Examine areas and conditions under which Work of this Section will be performed. Correct

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level per manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attached panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets with tamper proof through bolts and nuts. Locate headrail joints at pilaster centerlines.

E. Anchor urinal screen panels to walls per manufacturer's instructions.

F. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.

G. Equip each door with hinges, door latch, coat hook, and bumper. Equip outswinging doors with pull.

H. Install door strike and keeper with door bumper on each pilaster in alignment with door latch.

I. Field touch-up of scratches or damaged enamel finish will not be permitted.

J. Replace damaged or scratched materials with new materials.

3.3 ERECTION TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.4 CLEANING

A. Clean Work per Section 01 7400.

B. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inches.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Adjust hinges to position doors in 15 degree open position when unlatched. Return out swinging doors to 15 degree open position.

D. Adjust adjacent components for consistency of line or plane.

E. Clean panels of excess dust, dirt, and other contaminates.

3.5 PROTECTION

A. Protect finished Work until date of Substantial Completion.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 10 2813

TOILET ACCESSORIES

PART 1 - GENERAL

1.1. SUMMARY

A. Toilet accessories.

1.2. RELATED SECTIONS

A. Section 06 1000 – Rough Carpentry.

B. Section 09 2116 – Gypsum Board.

C. Section 09 3113 – Tile.

1.3. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Product Data: Manufacturer's specifications and technical data including the following.

1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.
3. Certified test reports indicating compliance with performance requirements specified herein.

C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware and installation procedures.

D. Samples: If requested by Architect.

1. 1 sample of each item and model specified.
2. 1 sample of finish for stainless steel, chrome plated, and aluminum accessories.

E. Quality Control Submittals:

1. Statement of qualifications.

F. Contract Closeout Submittals: Comply with Section 01 7800 – Closeout Submittals.

1. Operating and maintenance manuals.
2. Special warranties.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.4. QUALITY ASSURANCE

A. Manufacturer's Qualifications: Not less than 5 years experience in the actual production of specified products.

B. Regulatory Requirements: Comply with provisions of the Americans with Disabilities Act, ANSI 117.1.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 6000 – Product Requirements.

B. Packing and Shipping: Deliver products in original unopened packaging with legible manufacturer's identification.

C. Storage and Protection: Comply with manufacturer's recommendations.

1. Protect from elements and damage.

1.6. SPECIAL WARRANTY

A. Special Warranty:

1. Provide guarantee from Contractor, manufacturer, and installer for installed products for a period of 15 years from date of Substantial Completion against conditions indicated below. When notified in writing from Owner, promptly correct said deficiencies at no cost to Owner.

a. Deterioration of silver coating on mirrors.
b. Peeling, flaking or discoloration of chrome plating.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Subject to compliance with requirements, provide products from one of the following manufacturer:

1. Bobrick Washroom Equipment, Inc.
2. Kimberly-Clark
3. American Specialties, Inc.
4. Bradley Corporation.
5. A and J Washroom Accessories
6. American Standard Luxury Division

B. Substitutions per 01 6300 – Product Substitution Procedures.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.2. MANUFACTURED UNITS

A. See Toilet Accessories Schedule below for list of specified items.

2.3. KEYING

A. Key accessories alike.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.

1. Do not proceed until unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Comply with manufacturer's recommendations and written installation instructions.

B. Install accessories in locations indicated with anchor devices of types specified or required for given substrates.

C. Fasten securely, true, plumb, and level.

D. Drill holes to correct size and at locations that are concealed by accessory.

E. Install recessed accessories into wall openings with wood screws through cabinet side into wood blocking or studs, or sheet metal screws into metal backing or studs.

F. Install surface mounted accessories to metal or wood backing using proper type screws.

3.3. SPECIAL CLEANING

A. Just prior to Date of Substantial Completion, clean and polish exposed surfaces.

3.4. ADJUSTING

A. After completion of installation adjust accessories for proper operation.

3.5. SCHEDULE

A. Grab Bar

1. Manufacturer: Franklin Brass
2. Model Number: 5736, 5724 and 5718

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3. Length of Bar: 36”, 42” and 18”
4. Mounting: concealed
5. Finish: Stainless Steel
6. Bar Type: 1 1/4" Dia.
7. Miscellaneous: ADA

B. Soap Dispenser

1. Provided By Owner, Contractor to install.

C. Paper Towel Dispenser

1. Provided By Owner, Contractor to install.

D. Toilet Paper Holder

1. Provided By Owner, Contractor to install.

E. Feminine Hygiene Trash Receptacle

1. Manufacturer: Frost
2. Model Number: 622
3. Mounting: Surface
4. Finish: Stainless Steel

F. Waste Receptacle

1. Provided By Owner, Contractor to install.

G. Type of Accessory: Mirrors

1. Manufacturer: Bobrick
2. Model Number: B-165 1830
3. Height: 30"
4. Length of Bar: NA
5. Width: 18"
6. Depth: 1/2"
7. Construction: Type-430 Stainless Steel
8. Gauge: NA
9. Mounting: Surface
10. Finish: Bright Polish Finish
11. Mirror: No. 1 quality, 1/4" select float glass
12. Miscellaneous: NA

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

H. Type of Accessory: Mop Holder

1. Manufacturer: BradEx
2. Model Number: 9955 5-Holders
3. Height: N/A
4. Length of Bar: 48”
5. Construction: Stainless Steel

I. Type of Accessory: Wall Mounted Baby Changing Table

1. Manufacturer: Bradley
2. Model Number: 962 Series
3. Capacity: Not less than 250 lbs (113.4 kg) per ASTM F 2285
4. Size: 37.5” x 21.625”
5. Mounting: Recessed
6. Mounting Height: Meet ADA requirements per manufacturer's recommendations
7. Material and Finish: Stainless steel exterior, brushed finish with molded high-density polyethylene body and full-length steel hinge pin
8. Operation: Concealed pneumatic gas shock
9. Accessories: Integral liner dispenser and bag hook

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 10 4400

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1. SUMMARY

A. Fire protection specialties indicated on Drawings and specified herein. Include related accessories and attachments.

B. Fire extinguishers.

C. Semi-recessed fire extinguisher cabinets.

1.2. RELATED SECTIONS:

A. Section 06 1000 – Rough Carpentry.

B. Section 09 2116 – Gypsum Board Assemblies.

1.3. REFERENCES

A. ANSI/NFPA 10 - Portable Fire Extinguishers.

B. ANSI/UL 92 - Fire Extinguisher and Booster Hose.

C. ANSI/UL 711 - Rating and Fire Testing of Fire Extinguishers.

D. UL 299 - Dry Chemical Fire Extinguishers.

1.4. SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, and locations.

C. Product Data: Provide manufacturer's data for extinguisher operational features, color, finish, and anchorage details.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Operation and Maintenance Data:

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Comply with Section 01 7800 – Closeout Submittals.
2. Maintenance Data: Include test, refill or recharge schedules, and re-certification requirements.

1.5. QUALITY ASSURANCE

A. Regulatory Requirements:

1. Conform to Uniform Fire Code, latest edition, for requirements for fire extinguishers and fire blankets.

1.6. PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Fire Extinguishers: Subject to compliance with requirements, provide products from 1 of the following manufacturers:

1. AMEREX Fire Extinguishers.
2. J.L. Industries, Inc.
3. KIDDE Fire Extinguisher Company.
4. Larsen Manufacturing Co.
5. SENTRY Fire Extinguishers.

B. Fire Extinguisher Cabinets: Subject to compliance with requirements, provide products from 1 of the following manufacturers:

1. J.L. Industries, Inc.
2. Larsen Manufacturing Co.

C. Substitutions: Comply with Section 01 6300 – Product Substitution Procedures.

2.2. MANUFACTURED UNITS

A. Refer to Floor Plans for list of extinguishers and cabinets required.

2.3. FABRICATION

A. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Pre-drill for anchors.

C. Hinge doors for 180 degree opening.

D. Weld, fill, and grind components smooth.

E. Glaze doors with resilient channel gasket glazing.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify rough openings for cabinet are correctly sized and located.

3.2. INSTALLATION

A. Install fire extinguishers, cabinets, and accessories in accordance with manufacturer's instructions governing building and fire code requirements.

B. Install cabinets plumb and level in wall openings, 60 inches from finished floor to inside top of cabinet.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets or on wall brackets.

3.3. CLEAN AND ADJUST

A. Clean cabinet and glass surfaces.

B. Adjust cabinet doors to operate smoothly.

3.4. SCHEDULE

A. Fire Extinguisher Schedule

1. Item Number: fire extinguisher

a. Type of Extinguisher: 10 lb Dry Chemical Steel
b. Manufacturer: Buckeye Fire Equipment Company
c. Model: 10S ABC
d. Series: Dry Chem Portable
e. Class: A B C

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

f. Rating: 4A60BC
g. Agent: ABC
h. Capacity: 2 1/2 lbs
i. Finish: Epoxy Coated Steel

B. Fire Extinguisher Cabinet Schedule

1. Cabinet Item Number: cabinet

a. Type of Cabinet: Semi-Recessed Fire Extinguisher Cabinet
b. Manufacturer: Larsen Manufacturing Company
c. Model: 2409-RM
d. Series: Architectural Series
e. Trim Style: Semi Recessed-4-1/2
f. Inside Box Dimensions: 24 in. X 9-1/2 in. X 6 in.
g. Door Style: Vertical Duo
h. Finish on Doors: White Acrylic Enamel
i. Glazing: Clear Acrylic
j. Finish of Tub: White Acrylic Enamel
k. Color of Lettering: Black
l. Orientation of Lettering: Vertical
m. Lock: None

END OF SECTION

SECTION 21 0000

FIRE SUPPRESSION INDEX

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish all service tools, equipment, etc., which are required for the complete installation of all Fire Suppression Work, as indicated on the Drawings and specified herein. Fire Suppression work indicated on the Drawings and/or specifications covering other trades shall conform to Division 21 of these Specifications.

B. Work or equipment not indicated or specified, which is necessary for the complete and proper operation of the Fire Suppression systems, shall be accomplished without additional cost to the Owner.

C. Furnish all labor and materials required for fire suppression service and control connections to all the various items of equipment requiring fire suppression service throughout the project shown on the Contract Drawings (even if not shown on the Fire Suppression Drawings). Coordinate with other trades for the installation of required connections and service.

1.3 FIRE SUPPRESSION DIVISION INDEX

PART 2 – PRODUCTS

PART 3 – EXECUTION

END OF SECTION

SECTION 210500

GENERAL FIRE SUPPRESSION REQUIREMENTS

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes: General Mechanical Requirements specifically applicable to Division 21 sections in addition to Division 1- General Requirements.

B. Scope:

1. The work covered by this division consists of performing all operations in connection with the installation of fire protection system including site utility work as indicated under this section. This entire section applies to all fire protection systems and any and all interface with mechanical and electrical systems work and all mechanical, electrical, and civil sections of these specifications. This Contractor shall read and comply with all sections of these specifications including all General and Special Conditions.

1.2 REFERENCES

A. Standard Requirements:

1. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. All work shall be executed in accordance with the local and state codes, ordinances, and regulations governing the particular class of work involved. This Contractor shall be responsible for the final execution of the work under this heading to suit these requirements. In the event of a conflict between the various codes and standards, the more stringent shall govern. Where these specifications and accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Architect/Engineer. The Architect/Engineer shall prepare any supplementary drawings required, illustrating how the work may be installed so as to comply. On approval of the change by the Architect/Engineer, the Contractor shall install the work in a satisfactory manner without additional cost to the Owner. On completion of the various parts of the work, the installation shall be tested by the constituted authorities and approved, and on completion of the work, this Contractor shall obtain and deliver to the Owner final certificates of acceptance. This Contractor shall furnish copies of each certificate to the Architect/Engineer.

C. The Contractor shall secure all permits and licenses for his work and shall pay all fees in connection with such permits and licenses.

D. The contractor shall hold and save the Owner free and harmless from liability of any nature or kind arising from his failure to comply with codes and ordinances.

E. Any and all meter deposits and all utility extension costs shall be paid by the Contractor whose work is done in connection with the service that the meter is connected to.

F. Schedule of Referenced Organizations: The following is a list of the acronyms of organizations referenced in these Specifications:

1.	AABC	Associated Air Balance Council
2.	ADC	Air Diffusion Council 435 North Michigan Ave. Chicago, IL 60611
3.	AGA	American Gas Association 1515 Wilson Boulevard Arlington, VA 22209
4.	AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004
5.	ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
6.	ASHRAE	American Society of Heating Refrigerating and Air Conditioning Engineers 345 East 47th Street New York, NY 10017
7.	ASME	American Society of Mechanical Engineers 345 East 45th Street New York, NY 10017
8.	ASPE	American Society of Plumbing Engineers 960 Illuminating Building Cleveland, OH 44113
9.	ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
10.	AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
11.	AWS	American Welding Society 2501 NW 7th Street Miami, FL 33125
12.	CISPI	Cast Iron Soil Pipe Institute 1499 Chain Bridge Road McLean, VA 22101
13.	FM	Factory Mutual System 1151 Boston-Providence Turnpike Norwood, MA 02062
14.	FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Building 197 Washington, DC 20407
15.	NBFU	National Board of Fire Underwriters 5530 Wisconsin Avenue, Suite 750 Chevy Chase, Maryland 20815
16.	NEC	National Electric Code (of NFPA)
17.	NEBB	National Environmental Balancing Bureau

		8224 Old Courthouse Road Vienna, VA 22180
18.	NEMA	National Electrical Manufacturer's Association 2101 L Street, NW Washington, DC 20037
19.	NFPA	National Fire Protection Association Battery March Park Quincy, MA 02269
20.	NSF	National Sanitation Foundation Box 1468 Ann Arbor, MI 48106
21.	OSHA	Occupational Safety and Health Administration U.S. Department of Labor
22.	PDI	Plumbing and Drainage Institute 5342 Boulevard Place Indianapolis, Indiana 46208
23.	SMACNA	Sheet Metal and Air Conditioning Contractor's National Association 8224 Old Courthouse Road Vienna, VA 22180
24.	TIMA	Thermal Insulation Manufacturers Association Technical Services 1420 King Street Alexandria, VA 22314
25.	UL	Underwriters Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062

G. Underwriters Laboratories Inc. (UL): All materials, appliances, equipment, devices or appurtenances shall conform to the applicable standards of Underwriters Laboratories Inc., where such standards have been established.

1.3 DRAWINGS

A. Drawings and specifications (also known as contract documents) shall be considered as cooperative, and work or materials called for by one and not mentioned in the other, or vice versa, shall be done and furnished as though treated by both.

B. In the cases of discrepancies in figures, drawings, or specifications, the Architect/Engineer shall be notified immediately and his decision shall determine the necessary adjustment. Without such decision, said discrepancies shall not be adjusted by the Contractor save only at his expense, and, in case of any settlement or any complication arising from such adjustment to the Contractor, he shall bear all extra expense involved.

C. Should it appear that the work intended to be installed and/or provided, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings or specifications, the Contractor shall apply to the Architect/Engineer for such further drawings or explanations as may be necessary, allowing a reasonable time for the Architect/Engineer to supply same, and the Contractor shall conform to same as part of the Contract.

D. Should any doubt or question arise in respect to the true meaning of the drawings or specifications, reference shall be made to the Architect\Engineer whose decision shall be final and conclusive. No alleged oral admission, condonation, or inadvertent neglect on the part of the Architect/Engineer will be accepted as an excuse for inferior work.

E. The fire protection and related plans do not give exact details as to elevations of ductwork and piping, exact locations, etc., and do not show all offsets, control lines, pilot lines, and other installation details. The Contractor shall carefully lay out his work at the site to conform to the structural conditions, provide proper grading of lines, to avoid all obstructions, to conform to details of installation supplied by the manufacturer of the equipment to be installed, and thereby to provide an integrated, satisfactory operational installation.

F. Should the particular equipment which any Bidder proposes to install, require other space conditions than those indicated on the drawings, the Bidder shall arrange for such space with the Architect/Engineer before submitting his bid. Should changes become necessary on account of failure to comply with these details, the Contractor shall make such necessary changes at his (the Contractor's own expense).

G. The Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans which shall be checked by the Architect/Engineer and approved before the work is started, Contractor before work proceeds. Interference with structural conditions shall be corrected by the Contractor.

H. All equipment shall be installed in accordance with the manufacturer's recommendations. Provide all accessories and components for optimum operation as recommended by the manufacturer.

I. Utilities: The location, size, and pressure of utility lines are shown in accordance with the data given this office by others. As Architect/Engineers, we cannot and do not guarantee the accuracy of this data. Each Bidder shall check and verify this data. The points of connection to utility lines are approximate only and shall be verified by each Bidder prior to submitting his Bid.

J. Site visit: The Contractor shall visit the site prior to bidding and satisfy himself as the conditions under which the mechanical systems are to be installed. No subsequent allowance shall be made in his behalf for failure to make such a visit. Contractor shall examine all work noted under the demolition drawings and all new work and shall satisfy himself as to the extent of work required to be completed.

1.4 SYSTEM DESCRIPTIONS

A. See drawings for fire protection system requirements.

1.5 PRIOR APPROVALS

A. Each equipment item for which the Contractor desires to install equipment other than the specific item identified in the equipment schedule or equivalent equipment by manufacturers specifically named in the schedule, the Contractor shall bear full responsibility to prove to the Engineer that the furnished equipment is equivalent to or better than the specified item. Failure to provide such proof will result in rejection of the

shop drawing submittal by the Engineer. Prior written or verbal approval by the Engineer of equipment by other manufacturers will not relieve the Contractor of responsibility to provide equivalence. Prior approval is not required, however, any prior approval given is intended only to provide preliminary agreement that the alternate manufacturer may make equipment that complies with the specification requirements and not that all equipment manufactured by him is acceptable.

1.6 SHOP DRAWINGS

A. Shop drawings or fully descriptive catalog data shall be submitted by the Contractor for all items of material and equipment furnished and installed under this Contract. This shall include piping, ductwork, mechanical equipment, plumbing equipment, control items, etc. The Contractor shall submit to the Architect/Engineer a sufficient number of copies of all such shop drawings or catalog data to provide him with as many review copies as he may need, plus three (3) copies for retention by the Architect/Engineer. No materials or equipment shall be installed until officially approved by the Architect/Engineer.

B. Before submitting Shop Drawings to the Architect/Engineer for review, the Contractor shall examine them and satisfy himself that they are correctly representative of the material or equipment to which they pertain. The Contractor shall so note these Drawings before submitting them. The Contractor's review of Shop Drawings is not intended to take the place in any way of the official review of the Architect/Engineer, and the Shop Drawings which have not been reviewed by the Architect/Engineer shall not be used in fabrication or installing any work.

C. The review of Shop Drawings or catalog data by the Architect/Engineer shall not relieve the Contractor from responsibility for deviations from the plans and Specifications unless he has, in writing, specifically called attention to such deviations as the time of submission and has obtained the permission of the Architect/Engineer thereon, nor shall it relieve him from the responsibility for error of any kind in Shop Drawings. When the Contractor does call such deviations to the attention of the Architect/Engineer, he shall state in his letter whether or not such deviations involve any extra cost. If this is not mentioned, it will be assumed that no extra costs is involved for making the change.

D. After receiving approval on the make and type of materials, the Contractor shall order such materials in sufficient time so that no delay or changes will be caused. This is done to facilitate progress on the job and failure on the part of the Contractor shall render him liable to stand the expense of any and all delays occasioned by failure on this part to provide necessary details. All shop drawings shall be delivered to the Architect/Engineer's office within thirty (30) days from the date of the contract.

E. Shop drawings will be returned unchecked unless the following information is included: reference to all pertinent data in the Specifications or on the drawings, size and characteristics of the equipment, name of the project and a space large enough to accept an approval stamp. The data submitted shall reflect the actual equipment performance under the specified conditions and shall not be a copy of the scheduled data on the drawings.

1.7 SUBMITTALS

A. Submittal data shall be organized in commercial quality, three ring binders with durable and cleanable covers. Product information for each piece of equipment shall be separated by an indexing leaf with clear tabs. The product name and symbol (i.e. AHU/Air Handling Unit) shall be typed on white paper inserts and placed in appropriate tab. Complete data must be furnished showing performance, quality and dimensions. A signed review by the Architect/Engineer must be obtained before purchasing any equipment.

B. No review of the fire protection system shall be completed without all shop drawings, equipment, hydraulics, etc. being delivered as one package. No exceptions.

C. The following items shall be submitted for review by the Architect/Engineer but are not limited to:
   1. Utilities Piping & Materials whether furnishes by the contractor or others.
   2. Fire Protection Drawings & Hydraulic Calculations
   3. Cross Connection Control Devices
   4. Piping Material
   5. Fire Protection Equipment – including alarm valve, tamper switch, etc.
   6. Ductwork Shop Drawings – as part of fire protection drawings.

1.8 QUALITY ASSURANCE

A. General: Comply with Division 1.

B. Welder Qualifications: Welders shall be certified by the American Society of Mechanical Engineers (ASME) National Certified Pipe for the type of work being performed. Current operators' certificates in accordance with ASME standards shall be on file at the site and shall be available to the Architect/Engineer for examination. Coupons shall be available for review by the Architect and Engineer.

C. Locations of all pipes, ducts, outlets, appliance, etc., as shown on the drawings, are approximate only and are understood to be subject to such revisions as may prove necessary or desirable at the time the work is installed. Each Contractor will be required to install his work with relation to existing building conditions and shall be entirely responsible for the correctness of his work with reference to finished elevations, etc. Piping shown on the drawings is diagrammatic only and their exact locations, depths, and invert elevations shall be as required for proper flow and coordination with other trades.

D. The contract drawing depicts graphically the arrangement of piping and ductwork. Should local conditions necessitate a rearrangement, or if any of the piping or ductwork can be installed to better advantage in a different manner, the Contractor shall, before proceeding with the work, prepare and submit three (3) copies of Drawings of the proposed arrangement for the Architect/Engineer's review.

E. If the Contractor proposes to install equipment, including piping and ductwork, requiring space conditions other than those shown, or to rearrange the equipment, he shall assume full responsibility for the rearrangement of the space and shall have the Architect/Engineer review the change before proceeding with the work. The request for such change shall be accompanied by Shop Drawings of the space in question.

F. Each Contractor is responsible for the proper location and size of all slots, holes, or openings in the building structure pertaining to his work, and for the correct location of pipe sleeves.

G. Each Contractor shall coordinate his work with that of all other trades that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipelines which require a stated grade for proper operation. Drainage lines shall take precedence over water lines in determination of elevations. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical conduit and ductwork.

H. All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Lubricate all equipment properly in accordance with manufacturer's instructions. Furnish zerk grease fittings on all greaseable bearings.

I. Equipment and Materials: The materials and equipment shall be new and shall be the standard products of the manufacturers regularly engaged in the production of piping plumbing equipment, and fire protection equipment, and shall be the manufacturer's latest standard design. Where two or more units of the same class of equipment are required, these units shall be the products of the same manufacturer. However, the component parts of the systems need not be the products of the same manufacturer. Specific equipment specified hereinafter is to be considered a standard of quality and operation. In general, all capacities of equipment, and motor and starter characteristics are shown in schedules on the drawings. Reference shall be made to the schedules for specific information. The capacities shown are minimum capacities. Variations in the characteristics will be permitted only on written approval of the Architect/Engineer. All equipment shall be shipped to the job with not less than a prime coat of paint or as specified hereinafter. Insofar as is possible all items of the same type (i.e., pumps, fans, etc.) shall be by the same manufacturer. Where installation instructions are not included in these specifications or on the plans, the manufacturer's instructions shall be followed. All equipment affected by altitude shall be rated to operate at the altitude where it is to be installed.

J. Excavation and Backfilling: This Contractor shall do all necessary excavation and backfill for the installation of the Mechanical systems as may be required. Curb cuts, asphalt and concrete patching, cutting and patching existing floor, etc., shall be part of this Contractor's responsibility. No extra payment will be made for rock excavation. Trenches for all underground piping shall be excavated to the required depths. The bottoms of trenches shall be tamped hard and graded to secure maximum fall. Bell holes shall be excavated to assure the pipe resting for its entire length on solid ground. Should rock be encountered, it shall be excavated to a depth of 6 inches below the bottom of the pipe, and before laying the pipe, the space between the bottom of the pipe and the rock surface shall be filled with gravel, thoroughly tamped. Pipe laid in trenches dug in fill shall be supported down in the trenches and shall be filled. No roots, rocks or foreign materials of any description shall be used in backfilling the trenches. The backfill material shall be identical to the surrounding fill material and shall be placed in 6-inch layer, wetted, and compacted to the density of the adjacent soil. See Division 2 for additional information for site utilities. All surplus materials shall be hauled from the project by the Contractor at his expense.

K. Cutting and Repairing:
1. Responsibility of the Contractor whose work is involved. Coordinate with others to prevent unnecessary cutting and repairing.
2. Lay out and locate equipment, openings, and chases. Install sleeves, inserts, and supports. Arrange with those whose work is involved to do cutting and replacing caused by negligence or error with costs reimbursed by the Contractor at fault. Cutting and replacing of existing work shall be the responsibility of the Contractor whose work is being installed.
3. Removal or terminating connections of existing work which is abandoned or replaced shall also be done hereunder to provide correct and finished work.

L. Foundations: All equipment shall be provided with suitable foundations and supports. It shall be the responsibility of the Contractor to provide for the proper locations of these foundations and supports. This applies to all rooftop equipment also.
1. All concrete foundations required by equipment furnished by the Mechanical Contractor shall be constructed by them (except where otherwise noted) the conformity with the recommendations of the manufacturer of the respective equipment, and with the approval of the Architect/Engineer. All corners of the foundations shall be neatly chamfered. Foundation bolts shall be placed in the forms when the concrete is poured. Allow 1 inch below the equipment base for alignment, leveling and grouting with nonshrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary. After removal of the forms, the surface of the foundation shall be rubbed.
2. Unless otherwise noted, foundations shall be a minimum of 6-inch high. All concrete work performed by these Contractors shall conform entirely to the requirements of the Concrete Specifications which describe this class of work.

M. Code Requirements: Comply with state and local code requirements and ordinances. Call for inspections required by responsible building inspection authority.

N. Applicable Building Codes and Ordinances: Including the latest edition of each code, but not limited to the following:
1. International Building Code.
2. Uniform Mechanical Code.
3. Uniform Plumbing Code.
4. Governing Fire Department Requirements
5. Utility Company Requirements
6. National Fire Protection Association Standards
7. NFPA 70 - National Electrical Code
8. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
9. NEPA 90B - Installation of Warm Air Heating and Air Conditioning Systems
10. NFPA 13 - Sprinkler Systems
11. NFPA 101 - Life Safety
12. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment

O. Access Panels
1. Similar to Milcor, or as noted on the drawings, size as required for concealed expansion joints, valving, gauges, balancing dampers, valves, traps, pitot stations,

equipment and similar items requiring accessibility. Notify the General Contractor of each access panel location and the required size. Panels shall be proper type for ceiling or wall in which they are installed. The panels shall be furnished under this section of the Specifications, unless otherwise directed, but shall be coordinated to be compatible with walls and ceilings furnished under other sections.

1.9 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1

B. Large Items: Make arrangements with other trades on the job for introduction into the building of equipment too large to pass through finished openings.

C. Acceptance: Check and sign for materials to be furnished by others for installation under Division 15 upon delivery. Contractor shall be responsible for the storage and safekeeping of such materials from time of delivery until final acceptance.

D. Protection: Close ends of pipe and ductwork at the close of each working day during construction to prevent entry of foreign material. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Protect fixtures and equipment against damage during mechanical work with heavy paper or plastic until final clean-up.

E. Storage: Store equipment in covered enclosure or wrap with weather tight 6 mil Visqeen.

F. Shipping Protection: Protective casings, crating, and coverings to remain in place until start-up of equipment.

1.10 PROJECT CONDITIONS

A. Performance: All systems are to be rated at 5,500 ft. elevation.

1.11 SEQUENCING AND SCHEDULING

A. General: Comply with Division 1.

B. Schedule: Coordinate and order the progress of mechanical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.

C. Utility Interruptions: Schedule mechanical utility interruptions with the Architect/Engineer/Owner minimum of seven (7) days prior to the requested outage. Plan work so that duration of the interruptions a maximum of one day.

1.12 CONTROLS WIRING AND ELECTRICAL EQUIPMENT

A. All mechanical equipment controls wiring, conduit, relays, interlocks, and all accessories required for a completely operational controls system shall be the complete responsibility of the mechanical contractor. The contractor has the option to hire the project electrical

contractor to install fire protection controls wiring and conduit. Refer to specification 251000 for installation requirements.

B. Electrical items such as disconnect switches and motor starters associated with equipment provided by all Mechanical Divisions, when specifically mentioned to be furnished by the Mechanical Contractor, whether in these specifications or on the Electrical or Mechanical Drawings, shall be furnished by the Contractor. These items shall be mounted and connected as required for a completely operational system.

C. All electrical equipment characteristics (voltage, etc.) must be verified by the Contractor prior to ordering. If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Architect/Engineer of the change and shall then coordinate the change with the Electrical Contractor and shall pay all additional charges in connection with the change.

D. All motors shall meet all the requirements of all Electrical Divisions.

1. All motors shall be built in accordance with the current applicable IEEE, ASA, and NEMA standards. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. All motors shall have copper windings. All motors to have minimum power factor of 85% or have switched correction to 90%. Unless indicated otherwise, motors shall be NEMA design B with a service factor of 1.15 with 40°C rise and total temperature rise of 65°C ambient and when powered from the system voltage feeding the motor. TEFC motors shall a service factor of 1.00 with total temperature is of 65°C in the above conditions. Motors located in areas exceeding 40°C ambient shall be factory-rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Type N split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 HP or less may be shaded pole induction motors.

1.13 PROTECTION AGAINST HAZARDOUS CONDITIONS

A. The Contractor shall take precautions against hazardous construction conditions at all times during construction. The final condition of the facilities shall be safe, and where safety to operating personnel is jeopardized, suitable signage shall be posted.

B. Protruding metal (bolts, steel angles, etc.) potentially hazardous to maintenance and operating personnel, shall be cut back and/or protected to reduce the risk of injury. All openings between floors shall be protected with barriers around the openings, gratings across the openings, or steel bars through the openings to avoid and protect against injury.

1.14 HAZARDOUS SIGNS

A. Equipment room contains moving or rotating parts, floor openings, or other potentially hazardous environments and shall include a sign on the door entering it that shall read similar to the following: **Hazardous Area - Authorized Personnel Only.**

1.15 OPERATING AND MAINTENANCE INSTRUCTIONS

A. The Fire Protection Contractor shall furnish to the Owner a bound manual in triplicate, containing complete repair parts lists, and operating, service, and maintenance instructions on all mechanical equipment, fixtures, and systems.

B. The Fire Protection Contractor shall also provide training as required by NFPA to the Owner's operation and maintenance personnel.

1.16 OPERATION PRIOR TO ACCEPTANCE

A. The Owner shall have the right to operate any and all apparatus as soon as and as long as it is in operating condition, after Owner personnel have received operational training, whether or not such apparatus has been accepted as complete and satisfactory, except that this shall not be construed to mean operations before any required alterations or repairs have been made. This operation does not indicate acceptance of the equipment by the Owner. When the Contractor enters into a contract with the Owner, he agrees to the above.

1.17 WARRANTY AND SERVICE PROGRAM

A. Due to the critical performance requirements and to clearly establish warranty responsibility for this project, the Contractor shall provide a full service maintenance and warranty program to the Owner for one full year after beneficial occupancy (substantial completion).

B. This service program shall be included as part of the base bid and shall include service, maintenance, repair, replacement, lubrication, temperature control calibration and repairs, and documenting proof for all service and maintenance work on all equipment and system furnished by the Contractor.

C. A single representative in the employment of the Contractor shall be responsible for coordination and follow through of this program. This representative's name and phone number shall be submitted to the Owner as part of the maintenance manuals and supportive data. The Contractor shall respond to a request for service with 24 hours if so requested.

D. During this first year of operation, the following sequence of maintenance service shall be performed as a minimum.
   1. Clean strainers in piping.
   2. Pumps be lubricated and oiled once every four (4) months.
   3. System controls shall be calibrated throughout the facility at the end of six (6) months (following substantial completion). Any leaks in the piping systems shall be repaired.
   4. All equipment manufacturer's service recommendations shall be followed during this period.

1.18 FLUSHING AND DRAINING

A. It shall be the responsibility of this Contractor to properly drain and flush all ducts and pipes before use or acceptance to ensure that all debris is completely removed. Damage

caused by such debris remaining in the ducts or pipes shall be repaired by this Contractor at his expense. This Contractor shall demonstrate to the Architect/Engineer's representative that all piping is clean.

1.19 CLEANING

A. This Contractor shall remove from the building construction site all rubbish and dirt as it accumulates under the contract. At completion, all areas shall be broom cleaned and all obstructions, surplus materials, etc., removed.

1.20 GUARANTEE

A. The Contractor shall guarantee all materials, equipment, and workmanship furnished and installed by him under this Contract, to be free from all defects of workmanship and materials, and shall agree to replace at his expense, without expense to the Owner, at any time within one year after installation is accepted by the Architect/Engineer, any and all defective equipment, parts, etc., that may be found. (This excludes normal maintenance and daily servicing of equipment which is the Owner's responsibility.)

1.21 FLOOR, WALL, AND CEILING PLATES

A. Where exposed pipes pass through floors, finished walls, or finished ceiling, they shall be fitted with chromium-plated escutcheons of an approved pattern. Escutcheons and plates in Mechanical Rooms do not require chrome finish.

B. This Contractor shall be responsible for providing and installing all counter flashing. All openings in the roof shall be flashed and counterflashed. Use four pound lead flashing materials for all vent lines and welded flashing in steel lines passing through roof. The Mechanical Contractor shall notify the General Contractor where each roof penetrations are and the size of the opening.

1.22 PIPE SLEEVES

A. Schedule 40 steel pipe sleeves or pipe sleeves made of No. 20 gauge galvanized steel, properly secured in place with approximately 1/4" space between each sleeve and the surface of the pipe and/or insulation passing through it, shall be provided for all pipes passing through concrete floors, roofs, and masonry walls. All pipe sleeves shall be fixed in place as the walls and floors are built up. The Contractor shall furnish and locate all sleeves and pipes passing through concrete floors, exterior masonry walls, and roofs shall be made watertight with approved non-hardening plastic material. Sleeves through pipe chase or equipment room floors shall project a minimum of 2-inch above the floor and shall be of black steel pipe with waterproof flange at center of floor thickness. Each sleeve through a fireproof wall shall be packed with approved fireproof rope in the annular space.

1.23 PIPE HANGERS

A. Pipe hangers shall be Fee and Mason of a type suitable for each use. Perforated straps shall not be used in any work. For ferrous pipes up to and including 4 inch in size, use Fee and Mason Fig. 199 malleable iron, adjustable, split ring, swivel hanger. For piping larger than 4 inch, use Fee and Mason Fig 239 steel clevis hanger. Where several pipes

are parallel at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where indicated on the Drawings.

B. Hanger rod sizes shall conform to the following schedule:

1.	Pipe up to and including 2"	3/8" rods
2.	Pipe 2-1/2", 3" and 3-1/2"	1/2" rods
3.	Pipe 4" and 5"	5/8" rods
4.	Pipe 6"	3/4" rods
5.	Pipe 8”, 10”, and 12”	7/8” rods

C. Unless shown otherwise on the Plans, all horizontal runs of ferrous piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following spacing:

1.	Pipe up to and including 1-1/4"	8'
2.	Pipe 1-1/2" and 2"	10'
3.	Pipe 2-1/2" and 3"	12'
4.	Pipe 3 1/2” and 4”	14’
5.	Pipe 5” and 6”	16’

D. There shall be a hanger within 2 inch of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Vertical risers shall be supported by approved riser clamps at each floor. Vertical pipes within a space shall have not less than two supports.

E. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting, nor shall it be supported from equipment connection.

F. Expansion bolts shall be Ackerman-Johnson or Hilti.

G. Beam clamps suitable for use with this type of steel construction involved shall be Grinnell.

1.24 PRESSURE VESSEL CERTIFICATION

A. Not used.

1.25 ISOLATION

A. Excessive vibration or objectionable noise created in any part of the building by the operation of any equipment furnished and/or installed under the Mechanical Contract will be extremely objectionable and the Contractor shall take all precautions against the same by isolating the various items of equipment from the building structure and by such other means as may be necessary to eliminate all excessive vibration and objectionable noise produced by any equipment installed by them, and consequently, they shall design all foundations, supports, etc., for their equipment, and all piping with this end in view. In addition, these Contractors shall supervise the construction of all foundations and supports, whether they build them or not, in order that they may be constructed in such a manner as to prevent the transmission of objectionable noise and/or excessive vibration. Submit calculations on all vibration isolation equipment.

B. All equipment having moving parts shall be isolated from the building structure by means of Korfund isolation materials, unless specifically noted otherwise. All isolators shall be the same brand and shall be supplied from the same source. Equipment manufacturer's recommendations shall be followed in the isolation of equipment.

C. Vibration isolators shall have sufficient resilience to meet the following minimum efficiencies:

Motor HP	Equipment Room
Up to 5	90%
7-1/2 to 15	93%
20 to 40	95%
50 to 100	97.5%

D. Spring isolators shall be of the housed type with ribbed pads bonded to the underside of the baseplate or may be unhoused stable springs. Isolators shall be furnished with snubbers and limit stops where so recommended by the equipment manufacturer.

E. The Supplier of the isolating equipment shall, upon completion of the job, check all isolating materials and verify that they are installed properly, and submit a report in writing to the Architect/Engineer.

1.26 TESTING

A. Before completion of this project, the Contractor shall test all materials and equipment which normally require testing. Submit fire pump test per specification. All piping, etc., shall be tested to meet code requirements or the Specification requirements, whichever is more stringent.

B. All equipment shall be operated sufficiently long enough to prove to the Architect/Engineer that the equipment performs satisfactorily and meets the requirements set forth on the Plans or in these Specifications.

1.27 CERTIFICATIONS

A. Before receiving final payment, the contractor shall verify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications. Submit certifications and acceptable certificates to the Architect/Engineer.

1.28 GENERAL PIPING INSTALLATION REQUIREMENTS

A. Provisions for Drainage: All piping systems shall be installed so that they may be easily drained. Drain caps, plugs, or hose bibbs shall be installed at low points. Grade piping toward drain locations.

B. Alignment: All installed pipelines shall be straight and shall remain straight against strains. Proper allowance shall be made for expansion and contraction.

C. Clean as Installed: All piping shall be kept free from scale or loose dirt when installed and must be kept clean during the completion of the installation. All openings in the piping system shall be capped or plugged while awaiting further connections. All

detergents, solvents and other cleaning agents shall be compatible with the materials of fabrication of the system in which they are used. They shall not adversely affect the materials of mechanisms in the systems and they shall be acceptable to equipment manufacturers. All detergents, solvents, and other cleaning agents shall also be compatible with the process streams to be handled by the systems in which they are used.

D. Insulated Fittings: Install between any dissimilar metals such as steel and copper.

E. Expansion and Contraction: The Contractor shall make all necessary provisions for expansion and contraction with proper fittings, anchors, dresser couplings, loops, etc. Install flexible connectors on each pipe at each building expansion joint.

F. Welding: Refer to Paragraph 1.29 of this section of these specifications.

G. Bending: No bending of pipe will be permitted.

H. General: The installation shall be coordinated with respect to space available with heating, cooling, ventilating, and electrical installation. In every instance where there is a conflict in the routing of the piping and the ducting, the routing of the ducting shall govern. Installed piping shall not interfere with the operation or accessibility of doors or windows, shall not encroach on aisles, passageways, and equipment, and shall not interfere with the servicing or maintenance of equipment. Pipe shall be cut accurately to measurements established at the construction site and shall be worked into place without springing or forcing, properly clearing all openings and equipment. Cutting or weakening of structural members to facilitate piping, installation is not permitted. Pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Piping above ground shall be run parallel with the lines of the building unless otherwise noted on the drawings. Unless otherwise shown on the drawings, horizontal piping shall pitch down in the direction of flow with grade of not less than 1 inch in 40 feet. Piping connections to equipment shall be in accordance with details shown on the drawings or as recommended by the equipment manufacturer. Service pipe valves and fittings shall be kept a sufficient distance from other work to permit finished covering not less than 1/2 inch from such other work, and not less than 1/2 inch between finished covering on the different services.

I. Installation of Valves: Valves shall be installed at the locations shown on the drawings and where specified and where directed at site. Gate valves shall be used unless otherwise shown, specified, or directed. All valves shall be installed with their stems horizontal or above. Where tight shutoff is required, a composition seat globe valve or resilient seat ball valve shall be used.

J. All valves which must be used during operation, all control valve assemblies, instrument control cases, liquid level controls, gage glasses, orifices, relief valves, and other equipment which must be observed, adjusted, or serviced during operation shall be located conveniently accessible from an operating platform or grade.

K. In general, relief valves within processing unit limits shall be located conveniently accessible from an operating platform or grade.

1. Those in non-hazardous service, such as water, shall discharge directly to outside.

2. Relief valves should have no piping between the vessel or line and the valve inlet, except as shown on the drawings.
3. Relief valves shall be installed in a vertical position. Vent piping shall be braced and supported in a manner that will not produce excessive stresses in the relief valve and will permit removal of the relief valve without necessary temporary supports for the vent lines.

L. Equipment Connections: All piping connections to pumps and other equipment shall be installed without strain at the pipe connection of the equipment. The contractor shall be required as directed to remove the bolts in flanged connections or disconnect piping to demonstrate that the piping has been so connected. Pipe connections to equipment shall be made with unions or flanged fittings. Provide removable headers for large equipment for service access.

M. Joints
1. Flanged Joints: All flanged joints shall be face matched. Raised face flanges shall not be mated to flat-faced cast-iron flanges on valves or equipment. The raised face must be turned off. All flanged bolt holes shall straddle the horizontal and vertical center line unless otherwise noted.
2. Screwed Joints: Screwed pipe joints shall have American Standard Taper Pipe Threads ANSI-B2.1 Latest Edition. Burrs formed when cutting pipe shall be removed by reaming. Care shall be taken that the inside of pipe is thoroughly clean and free of cutting oil and foreign matter before installation. Joints shall be made perfectly tight by the use of Teflon tape or approved Teflon thread sealing and lubricating compound.
3. Solder-Joints: Tubing shall be cut square and burrs removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool or wire brush before seating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Joints for serrated fittings on water, compressed air below 60 psig, and vacuum lines shall be made with a 95 percent tin and 5 percent antimony. Cored solder or solder containing lead will not be permitted.

N. Reducers: Reduction in pipe size shall be made with one piece reducing fittings. Bushings reducing at least two pipe sizes will be acceptable only when there is no room for reducing couplings or swaged nipples.

O. Unions: All piping unions shall be of the ground joint type constructed from materials equivalent in alloy composition and strength to other fittings specified with which they are used. Union Pressure classes and end connections shall be the same as the fittings used in the lines with the unions. Steel unions shall have hardened stainless steel seating surfaces on both faces.

1.29 WELDING

A. All welding of piping covered by this specification, regardless of condition of service shall be accompanied as follows:
1. The welding shall be in accordance with the recommendations of the American Welding Society. Mitering of pipe to form elbows, notching to form these, or any similar construction will not be permitted. Welding fittings shall be installed on all welded lines. Joints to be welded shall be properly aligned and spaced,

using special welding clamps where necessary. All welders to be employed shall have passed qualification tests prescribed by the National Certified Pipe Welding bureau (or by another reputable testing laboratory or agency) using procedures approved by the American Society of Mechanical Engineers or the American Welding Society. The welders will be required to pass qualification tests when the work of the welder creates a reasonable doubt as to his proficiency. Tests shall be conducted at no additional expense to the Owner.

2. Each welder shall, in addition to having passed the prescribed qualification tests (as noted in Paragraph 1.30.A.1), prepare sample coupons at the job site on a portion of pipe that is cut such that the cross section of the weld is open to view. The sample weld should be prepared using a 6 inch diameter pipe. The sample shall reflect a continuous weld with perpendicular cut out to show the weld in cross sectional view. This sample, when accepted and approved by a certified welding inspector, shall be used as a standard of quality to compare to other welds that this welder will be performing on the job. This same sample weld will also be a basis for accepting or rejecting the welder for working on this project. The sample weld shall be identified with a date and the welder's name and shall be kept at the site throughout the project.
3. All welding on pressure piping shall conform to all of the requirements of the American Society of Mechanical Engineers Code for Pressure Piping - B31.1 (An American National Standards Institute publication), as defined in the latest edition of the ANSI Power Piping B31.1 Manual. All welding shall also conform to all of the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. All chapters, current addenda and supplements of these manuals shall apply. This code shall be used to establish standards of performance and quality of welds. However, the Owner reserves the right to perform radiographic testing of all welds, to compare any of the welds to the approved "standard" sample welds of each welder, and to compare the welds to the welding diagrams and sketches of those recommended in the ANSI B31.1 Power Piping Manual. The intent is to obtain the highest quality welding job possible. The cost of any initial radiographic testing, for random inspection, shall be paid for by the Owner. If radiographic random testing reveals that a weld is defective, the Contractor shall bear the cost of all repairs and re-testing necessary to be made to subject weld until conformance with radiographic tests is reached. The potential for random radiographic testing and welding quality control applies to all pressure piping systems in this project, including systems below 100 psig. If a question should arise regarding the possibility of faulty welding or if there are obvious visual defects in the welding, the Contractor shall be required to correct such deficiencies to a quality level consistent with the recommendations, welding diagrams and sketches in the ANSI B31.1 Manual. The quality level shall also reflect that of the approved sample welds accomplished by each welder for this particular project.

1.30 TESTING FOR PIPING SYSTEMS

A. General: Before insulation is applied, all piping, equipment, and accessories installed under this contract shall be inspected and tested by the Contractor. All labor, material, and equipment required for testing shall be furnished by the Contractor. The Contractor shall be responsible for all repairs and retesting as required. All instruments and other equipment whose safe pressure range is below that of the test pressure shall be removed from the line or blanked off before applying tests. Prior to performing tests, all lines shall

be "blown" free of all loose dirt and foreign particles. The lines shall then be thoroughly flushed with water (liquid lines only) at a sufficient flow rate and period of time, to ensure complete cleaning of the lines of all dirt, scale, and foreign matter. Satisfactory flushing of the lines shall be subject to approval. After testing and flushing lines, all filters and strainers shall be cleaned.

B. Safety: Since the Risk of failure, with the attendant possibility of injury, is appreciable greater with further testing, all safety measures required by codes or ordinance or reasonable applicable to the situation shall be taken.

C. Concealment: Equipment or piping to be pressure tested shall not be insulated, covered, or concealed prior to that test. Compression joint underground piping may be backfilled prior to pressure test except that joints shall remain exposed until after the test, but tie rods, clamps, etc., shall be in place and fastened.

D. Pressure Ratings: These tests shall not be used to establish pressure ratings.

E. System Protection: Protect all piping and equipment against overpressure, collapse from vacuum, and hydraulic shock during the filling, testing and draining procedures. Seats of iron valves shall not be subjected to a pressure in excess of the maximum cold working pressure of the valve. Pressure tests against other closed valves shall not exceed twice the normal rating. Note that where significant differences in elevation exists, there is a risk of overpressure in the lower portions of the system in order to attain test pressure in the upper portion of the system

F. Test Temperature: Apply test pressure only after the system and test medium are at approximately the same temperature, preferably not less than 60°F. Note that some applicable codes require testing above a specified minimum temperature.

G. Sectionalizing: Systems may be separated into sub-systems for testing if such action will expedite or simplify the testing.

H. Temporary Supports: During hydrostatic testing of lines provide temporary supports to prevent overstressing supports or hangers. When tests are completed, remove all temporary supports, locks, stops, etc., and adjust supports for their cold load and alignment.

I. Testing: Fire protection water piping shall be tested hydrostatically at the test pressures specified and duration required by NFPA. Leaks shall be located by soap testing.

J. Test Report
1. A detailed report of pressure tests on piping and equipment shall be forwarded in duplicate to the Architect/Engineer. This report shall show date of test, lines tested, test medium, length of time test pressure was held, pressure drop or rise, and extent of venting or repressurizing.

1.31 COOPERATION WITH OTHER TRADES

A. The Contractor shall refer to other sections of these specifications covering the work of other trades which must be carried out in conjunction with the mechanical work so that

the construction operations can proceed without harm to the Owner from interference, delay or absence of coordination.

1.32 FIELD MEASUREMENTS

A. The Contractor shall verify the dimensions covering the mechanical work at the building. No extra compensation shall be claimed or allowed on account of difference between actual dimensions and those indicated on the drawings. He shall examine the adjoining work on which Mechanical work is dependent for maximum efficiency and shall report any work which must be corrected. No waiver of responsibility for defective work shall be claimed or allowed due to failure to report unfavorable work conditions affecting Mechanical work.

1.33 SAFETY GUARDS

A. The Mechanical Contractor shall furnish and install safety guards required in order to obtain certificates of inspection from all authorities having jurisdiction. All belt driven equipment, projecting shafts, and other rotating parts shall be enclosed or adequately guarded. Provide coupling guards on all rotating shafts.

1.34 PROTECTION

A. All work, equipment, and materials shall be protected at all times to prevent obstruction, damage, or breakage. All pipe openings shall be closed with caps or plugs during installation. All equipment shall be covered and protected against dirt, water, chemical, or mechanical injury. At the completion of the work, all equipment shall be thoroughly cleaned and the entire system shall be delivered in a perfect, unblemished condition.

1.35 PAINTING AND IDENTIFICATION

A. All equipment shall be delivered to the job with suitable factory finish. Should the finish be marred in transit or during installation, it shall be finished to present a neat, workmanlike appearance.

B. Except as elsewhere hereinafter specifically required, any painting of equipment, piping, ductwork, grilles, insulation, etc., furnished and installed under this Section of the Specifications will be done by the Painting Contractor. However, the Mechanical Contractor shall leave his equipment clean and free from any grease, dirt, rust, etc., and in suitable condition for painting.

C. No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during the painting operation.

D. The piping shall be painted the basic color as indicated in other sections of these specifications and shall be marked every 10 feet on centers with Brady pipe markers. Arrows, approximately 6 inch in length and spaced about 10 feet on centers shall indicate the direction of the flow pipe. Locate additional labels as required in Mechanical Rooms. Staple in place, brush with clear lacquer. Markers shall state pipe size, flow direction, and pipe usage (such as "cold water," etc.).

1.36 RECORD DRAWINGS

A. The Contractor shall, during the execution of the work, maintain a complete set of drawings upon which all dimensional locations of equipment piping and all deviations and/or changes in the work shall be recorded. Water, storm, and drainage mains shall be delivered to the Architect/Engineer in good condition upon the completion and acceptance of the work and before final payment is made.

1.37 SUPPLIER RESPONSIBILITY

A. Each supplier, whether furnishing equipment as specified or as a substitution shall be responsible for certifying that the equipment is properly installed and that the warranty is valid. Submit written reports on the installation and the equipment performance when requested to do so by the Architect/Engineer (or his representative). Each supplier shall be responsible for furnishing qualified personnel at the job site at anytime requested by the Architect/Engineer (or his representative) during the construction or warranty periods.

END OF SECTION

SECTION 210513

COMMON MOTOR REQUIREMENTS FOR FIRE-SUPPRESSION EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. It is the intent of this specification to define all motors furnished under all sections of the specifications for this project which will provide efficient operation, reliability, ease of maintenance, and repair along with reduced operation costs.

B. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion-proof when located in hazardous atmospheres.

C. Motors mounted in direct sun shall be provided with a shield to forbid direct radiation from the sun when the sun is 45 degree or greater above the horizon.

D. All supply fan motors mounted in air handling units shall have Class F insulation.

E. Open drip-proof motors shall be NEMA design B with Class B insulation and a 1.15 service factor with 40 degree C ambient and a total temperature rise of 65 degree C.

F. TEFC motors shall be NEMA design B with Class F insulation and a 1.15 service factor with 40 degree C ambient and a total temperature rise of 65 degree C.

G. Severe duty motors shall be NEMA design B with Class F insulation and a 1.15 service factor with 40 degree C ambient and a total temperature rise of 65 degree C.

1.3 GENERAL

A. All motors covered by this specification shall conform to all applicable requirements of NEMA, IEEE, ANSI and NEC Standards. They shall be free from defective material and workmanship and fully capable of performing in accordance with the manufacturer's nameplate rating.

B. Motors shall be approved by Underwriter's Laboratories (UL) for the service specified.

C. Unless otherwise specified, motors shall be suitable for operation in either direction--(CW or CCW) or rotation.

D. Motors shall be Westinghouse II, Reliance XE, Gould E-PLUS, GE Energy Savery, or approved equal.

E. All fractional H.P. motors shall be permanent split capacitor (P.S.C.) with U.L. listed overload protection. The protector shall be calibrated to trip out when the winding reaches a pre-determined temperature and automatically reset when the temperature returns to a safe limit.

1.4 EFFICIENCY

A. All motors shall be special high efficiency design. These motors shall be different than manufacturers' standard product, in that losses are reduced by incorporation of design features including the use of low loss lamination steel, increase in stator/rotor length, increase in copper windings, utilization of high efficiency ventilating fan, computer optimized slot configuration and air gap.

B. All motors shall be all copper wound, high power factor, high efficiency motors. Motor efficiency shall be as determined by IEEE Standard 112A, test method B. Test results shall be submitted to the Engineer.

C. Manufacturer to furnish % efficiency, % PF, amps at Full Load, 3/4 Load, and 1/2 Load with quotation and be prepared to furnish actual test results on individual ratings if required.

PART 2 – PRODUCTS

2.1 GENERAL

A. Motors shall be 60 Hertz voltage as indicated on drawings, Squirrel Cage induction type suitable for across-the-line starting and continuous duty.

B. Motors shall have copper windings.

C. All motors shall be suitable for application without exceeding Class B rise in ambient temperatures up to and including 65 degree C at 1.15 Service Factor. Motor nameplates shall state suitability for 65 degree C ambient application.

D. All motors shall be suitable for application without exceeding Class B temperature rise at altitudes up to and including 9900 feet at a 1.00 Service Factor.

E. Motors shall operate successfully under running conditions at rated load with +10% of rated voltage or +5% of rated frequency or a combined variation in voltage and frequency of +10% (sum of absolute values).

F. Motors will have at least a nominal 85% power factor rating at full load and rated voltage. Exclusion from this requirement are motors which draw less than 1,000 watts at full load and motors with synchronous speeds less than 1800 RPM. Test verification shall be available upon request.

2.2 INSULATION

A. Motors shall have non-hygroscopic Class B or Class F insulation system as required; however, temperature rise shall not exceed Class B rise at rated load per NEMA Standards.

B. The insulation system shall be provided with sufficient treatment so that the completed insulation system will have a minimum resistance of 1.5 megohms after 168 hours of testing to a humidity chamber maintained at 100% relative humidity and 40 degree C ambient.

2.3 TESTS

A. Each motor shall be given a routine factory test per NEMA and ASA Standards to ensure compliance with this specification.

2.4 BEARINGS

A. Bearings shall be shielded, regreasable, vacuum degassed steel ball bearings, specially selected for electric motor service and long-life expectancy (B-10 MINIMUM).

B. Bearings shall be lubricated with a premium moisture resistant grease formulated to operate over a temperature range of -20 degree F to +300 degree F.

C. Bearing identification by AFBMA number shall be shown on motor nameplate.

2.5 ENCLOSURES

A. Construction shall be of rugged corrosion resistant metal including a one-piece frame, brackets, conduit box and fan shroud.

B. Fans shall be bi-directional and constructed of low inertia inert material.

2.6 CONDUIT BOXES

A. Conduit boxes are to be diagonally split, rotatable in 90 degree turns, gasketed cast iron construction with threaded conduit holes.

B. Ground lug suitable for grounding motor frame shall be furnished inside of conduit box.

C. A neoprene lead seal separator gasket shall be mounted between motor frame and conduit box to prevent entry of moisture and dust into the motor.

D. Conduit box size must meet or exceed minimum as shown in NEC Standards based on motor full load current.

2.7 HARDWARE

A. Corrosion-resistant cadmium plated grease plugs shall be provided for relubrication of bearings.

B. An external shaft flinger shall be provided on the shaft to prevent entrance of moisture or dust into the bearings.

C. All motors Frame 182T and larger shall have lifting eyebolts for lifting the entire motor.

D. An easy-to-read nameplate shall be provided on each motor and shall include at least the following information:
1. Horsepower
2. RPM
3. NEMA Design
4. Phase
5. Hertz
6. Service Factor
7. Ambient Temperature
8. Frame Size
9. Duty
10. Class of Insulation
11. Locked KVA Code
12. Full Load Amps
13. Model or Catalog Number
14. Bearing Identification
15. Guaranteed Minimum Efficiency
16. Nominal Efficiency
17. Voltage

2.8 MOTOR CONSTRUCTION

A. Motors shall be dynamically balanced to limits as indicated below:

Speed (Peak-to-Peak)	Maximum Amplitude
3500 & Above	.0010
1700 to 3499	.0015
Less than 1700	.0020

2.9 FINISH

A. All external surfaces shall be prime painted with red oxide zinc chromate primer to prevent corrosion.

B. The finish coat of paint shall be a full-gloss epoxy enamel paint. External finish shall protect against moisture and have superior heat resistance to withstand the effects of sunlight and outdoor weathering without chipping or cracking.

2.10 EFFICIENCY

A. Motors furnished shall meet or exceed the efficiency listed on the following Table.

HIGH EFFICIENCY MOTORS

HP	3600 RPM EFFICIENCY		1800 RPM EFFICIENCY		1200 RPM EFFICIENCY	
	NOMINAL	MINIMUM	NOMINAL	MINIMUM	NOMINAL	MINIMUM
1	81.5	78.5	84.0	81.5	78.5	75.5
1.5	81.5	78.5	84.0	81.5	84.0	75.5
2	84.0	81.5	84.0	81.5	86.5	84.0
3	86.5	84.0	88.5	86.5	88.5	86.5
5	88.5	86.5	90.2	88.5	88.5	86.5
7.5	88.5	86.5	90.2	88.5	88.5	86.5
10	88.5	86.5	90.2	88.5	90.2	88.5
15	90.2	88.5	91.7	90.2	90.2	88.5
20	90.2	88.5	91.7	90.2	91.7	90.2
25	90.2	88.5	93.0	91.7	91.7	90.2
30	91.7	90.2	93.0	91.7	91.7	90.2
40	91.7	90.2	93.0	91.7	93.0	91.7
50	91.7	90.2	94.1	93.0	93.0	91.7
60	93.0	91.7	94.1	93.0	93.0	91.7
75	94.1	93.0	94.1	93.0	94.1	93.0
100	94.1	93.0	95.0	94.1	94.1	93.0
150	94.1	93.0	95.0	94.1	94.1	93.0
200	94.1	93.0	95.0	94.1	95.0	94.1
250	95.0	94.1	95.0	94.5	-	-

END OF SECTION

SECTION 211300

AUTOMATIC SPRINKLER SYSTEMS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. This specification, in conjunction with the contract drawings and all other specifications indicate materials and operations required for the installation of automatic sprinkler systems, including design, shop drawings, equipment, underground supply system, pipe and fittings above ground, fire department connections, sprinkler systems, guard rail, operating instructions, identification, tests, and sterilization of piping and system.

B. Any variation of the specification's intent or apparent conflict from this specification shall be submitted to the ARCHITECT/ENGINEER for written response. The response shall be incorporated into the drawings and shall be the final word on the item. The Contractor shall incorporate any change at no charge to the Owner.

1.2 REFERENCES

A. This specification section is not limited to the following specification:
210000 – PIPE AND PIPE FITTINGS
210500 – GENERAL FIRE SUPPRESSION REQUIREMENTS
210513 – COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT

B. The current editions of the following standards are a part of this specification.
1. National Fire Protection Association (NFPA) Standards.
   a) 13 Standard for the Installation of Sprinkler Systems.
   b) 24 Private Fire Service Mains.
   c) 70 National Electrical Code.
   d) 72 National Fire Alarm Code.
   e) 25 Standard for Inspection, Testing and Maintenance of Water Based Fire Protection Systems.
2. American Water Works Association Standard Specifications.
   a) C600 Standard for the Installation of Ductile-Iron Water Mains and Their Appurtenances.
   b) C151 Ductile-Iron Pipe
   c) C110 Ductile-Iron and Gray Iron Fittings.
   d) C111 Rubber Gasket Joints for Ductile-Iron and Gray IronPressure Pipe and Fittings.
   e) C104 Cement-Mortar Lining for Ductile-Iron and Gray Iron Pipe and Fittings.
   f) C500 Metal Seated Gate Valves for Water Supply Service.
   g) C601 Standard for Disinfecting Water Mains.

C. Underwriters' Laboratories, Inc. (UL), Publication: Fire Protection Equipment List.

D. Factory Mutual System Publication: Approval Guide.

E. American Insurance Association Publication: Internal cleaning of sprinkler piping (GP-4).

1.3 SYSTEM DESCRIPTION

A. Design
1. The designer of the fire protection systems shall be:
   a) A registered Professional Fire Protection Engineer in the State of New Mexico. The registered Professional Engineer shall stamp all plans.
2. The contractor is responsible for the design and installation of the fire protection system in accordance with these specifications and the contract drawings. The Contractor shall coordinate with architectural, civil, mechanical, and electrical, design and construction documents, to ascertain the required information, to affect a properly designed fire protection system for the building construction and occupancy classification.
   a) The contractor is responsible to design the automatic sprinkler system in accordance with these specifications and the contract drawings. The contractor shall refer to all architectural, mechanical, and electrical drawings, to ascertain the required information, to affect a properly designed sprinkler system for the building construction and occupancy classification.
3. The design of fire protection systems shall be complete with all necessary accessories for proper operation and shall include seismic support details.
4. The fire protection water supply lines, controlling devices, protective devices, alarm systems, supervisory devices, and related equipment shall be compatible so that all equipment will function together as specified.
5. The design shall comply with all mandatory, advisory interpretations, and recommended applicable rules of the latest editions of the referenced codes and standards in Section 1.3, “References,” except where otherwise noted on the drawings or specified herein.
6. The Contractor shall produce design drawings that indicate the extent and arrangement of the fire protection system.
7. The contract drawings indicate the extent and general arrangement of the automatic sprinkler systems.

B. Spacing and Pipe Sizing
1. Unless otherwise specified or shown on the drawings, the sprinkler system shall be a wet pipe system, utilizing a Light Hazard hydraulic design.
2. Hydraulically system shall be designed on the contract drawings having the following characteristics:
   a) The design area shall be the hydraulically most demanding "rectangular area" having a dimension parallel to the branch lines equal to 1.4 times the square root of the area of sprinkler operation.
   b) Maximum water flow velocity shall not exceed 20 feet per second in any sprinkler system piping of hydraulically designed systems.
   c) The hose allowance shall be added to the sprinkler requirement at the point(s) where the hose station(s) connect(s) to the sprinkler system. The selected hose station(s) shall be within or nearest to the area of sprinkler application.
   d) Hydraulic design shall be based upon the water supply data shown on the drawings or obtained from the local Municipal Water Department.

e) Hydraulic calculation methods shall be used as a minimum for Light Hazard, wet-pipe systems, unless otherwise specified. The minimum operating area allowed shall be either 1500 feet^2 or the entire area for smaller systems. No allowances or reductions shall be permitted without written approval from the ARCHITECT/ENGINEER.

f) Extend all (regardless of job size) hydraulic calculations back to the effective point of connection including the sprinkler lead-in to the fire water main supplying the building, unless indicated on the contract drawings.

g) The distance between sprinklers either on branch lines or between branch lines shall not be less than 6 feet distance apart.

C. Seismic Protection

1. Seismic protection for automatic sprinkler systems is required for all new systems.
   a) Seismic separation joints are required in areas separating the modified area of the sprinkler system and that area which is not to be upgraded for seismic protection.
   b) The installation guidelines for seismic protection in NFPA 13 shall be used. Where an alternative method (other than NFPA 13) of providing seismic protection of a sprinkler system is to be used, only UL Listed or FM Approved material shall be permitted. The alternative method shall have a design based on a dynamic seismic analysis certified by a registered Professional Engineer in the State of New Mexico and the registered PE shall stamp all drawings.

D. Protection of Areas Subject to Freezing

1. All anti-freeze systems require the installation of a reduced pressure backflow prevention (RPBFP) device. If a RPBFP is installed on the entire sprinkler system, then no additional RPBFP is required for the anti-freeze system.
2. Gridded or looped dry pipe or preaction systems are not allowed. The design for these systems shall be of the conventional tree design.

E. Fire Department connections shall be as follows:

1. Install Fire Department connections, where shown on the drawings.
2. When the sprinkler system hydraulic demand (not including exterior hose demand) exceeds 1000 gpm, a 6-inch 3-way Fire Department connection shall be provided.
3. A single fire department connection shall be provided to supply all fire protection systems for a building that has greater than 5 sprinkler risers.

F. Elevator Shafts and Machine Rooms

1. Sprinklers are required at the tops of all elevator shafts and in the elevator equipment rooms. Sprinklers shall be protected from freezing.
2. Provide an OS&Y gate valve to shut off all sprinkler water flow into the elevator shaft and into the elevator machine room. Where possible, piping should be arranged such that a single valve can shut off water to both locations.
3. The valve(s) shall be at a readily accessible location, no more than 7’0” above finished floor, inside a clearly marked wall cabinet.

1.4 SUBMITTALS

A. Shop Drawing Submittals
1. Provide as required by Division 1, Descriptive Submittals, to the ARCHITECT/ENGINEER.
2. As soon as practicable after award of contract and prior to fabrication, contractor shall submit to the ARCHITECT/ENGINEER for approval, complete shop drawings, manufacturers' catalog data, system and component operating instructions and hydraulic calculations for the sprinkler system and underground piping shown on plot plans.
3. NO INSTALLATION WILL BE PERMITTED prior to the ARCHITECT/ENGINEER approval of complete shop drawings.

B. Presentation:
1. New Sprinkler Systems
a) New drawings shall be identical in size, scale, orientation, and title as the original building construction contract drawings unless otherwise noted.

C. Drawing Details
1. Unless otherwise specified or shown on drawings, new floor plans and full height cross sections shall be drawn at a scale of 1/4" = 1'-0" and arranged such that the north arrow points to the top or to the left of the sheet. Other details shall be drawn to a larger scale, as required. Riser elevation details shall be drawn to a scale of 1/2" = 1'-0"
2. No more than one building or one floor shall be shown on a sheet.
3. Drawings shall show all details required and recommended by NFPA 13, for "Working Plans" in addition to the following:
a) A name or room number shall appear in each room; and a scaled key plan, oriented the same as the floor plan, shall appear on each partial plan sheet.
b) All obstructions to the sprinkler layout shall be shown, including but not limited to, HVAC ducts, lighting, electrical buss ducts.
c) Building column lines shall be labeled.
d) Existing work and new construction shall be clearly differentiated on the drawings (where applicable).
e) All lines and details shall be drawn; "opposite hand" or mirror image IS NOT acceptable -- separate drawings shall be made.
f) All pipe lengths shall be shown, center-to-center of fittings.
g) Where more than one type of pipe is used, each piece of pipe shall be identified as to type on the drawings.
h) The drawings shall be kept neat and well arranged, with legible notes and figures to permit photographic reduction to one half size or smaller.
i) No lettering shall be smaller than 1/8 inch.

D. Plot Plans
1. Plot plans shall be drawn to 1" = 20'-0" unless otherwise shown on the contract drawings.
2. Previous references to orientation, legibility, and lettering shall apply.
3. Plot plans shall show all details required by NFPA 13 and 24.

E. As-Built Drawings
1. Upon completion of the work, the Contractor shall revise all drawings to agree with the construction as actually accomplished. The notation "As-Built" shall be entered in the revision block, dated and initialed.
2. The As-Built drawings shall show the entire sprinkler system as it existed at the completion of the contract work.
3. The original As-Built drawings shall be delivered as directed by the ARCHITECT/ENGINEER.

1.5 ALTERNATES/ALTERNATIVES

A. Where specific manufacturers or model numbers are mentioned in these specifications, proposed substitutions shall be included in the submittal package furnished to the ARCHITECT/ENGINEER for approval after contract award.

B. If UL-listed or FM-approved equipment is commercially available, none other will be approved.

1.6 WARRANTY

A. All sprinkler system components furnished under this contract shall be guaranteed against defective design, materials, and workmanship for the full warranty time, which is standard with the manufacturer and/or supplier, but in no case less than one year from the date of system acceptance.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Materials and equipment used in the installation of the sprinkler system shall be new and listed by the UL Fire Protection Equipment Directory or the FM Approval Guide, latest edition. The standard products and the latest design of the manufacturer shall be used, and installed per their listing, approval, or manufacturer recommendations. All products listed or approved by prior editions of the UL Director of FM Approval Guide will not be acceptable, if not listed or approved in the most recent edition of the directory or approval guide.

B. Where two or more units of the same class of equipment are required, these units shall be products of the same manufacturer (e.g., couplings shall be from one manufacturer.) All materials shall be installed per their listing or approval and per the manufacturer's recommendations and specifications.

C. Tape for screwed joints shall be minimum ½-inch wide.

D. Corrosion protection tape shall be Scotchwrap 51, manufactured by 3M Company or approved equivalent.

2.2 SPRINKLERS

A. Types

1. Unless otherwise specified, allowed per other section of this document, or shown on the drawings, sprinklers shall be nominal, ½-inch orifice, automatic, closed-head sprinklers rated at 155ºF (68ºC) Quick Response, frangible bulb type fusible element.
2. Higher temperature rated sprinklers shall be installed where heads are exposed to high ambient temperature, exposed to the direct rays of the sun, beneath skylights or windows and installed in the vicinity of heating equipment, or in attics. The sprinkler temperature chosen shall be a minimum of 50ºF above the maximum ambient temperature, and no greater than 100ºF above the ambient conditions, unless specifically directed by NFPA 13.
3. Rooms containing electrical equipment shall be protected with sprinklers having the following minimum temperature ratings, but no less than 50ºF above normal ambient room temperature:
   a) Transformer and Switchgear rooms; Elevator machine rooms — 212ºF (100ºC)
   b) Computer rooms — 155ºF (68ºC) QR
   c) Top of elevator shafts — 212ºF (100ºC)
4. On-Off sprinklers are not allowed. FM approved or UL listed on-off sprinkler systems, like the Viking FireCycle (or approved equal), are allowed.
5. Quick Response (QR) sprinklers, where specified on the drawings, shall have a Response Time Index (RTI) of 50 or less in English units and 28 or less in metric units.
6. Sidewall sprinklers shall be Underwriters' Laboratories listed or Factory Mutual approved for Ordinary Hazard Occupancy.
7. Extended coverage sprinklers are not allowed.
8. Only sprinklers with a "Belleville" type seal shall be used. No O-Ring sealed sprinklers shall be allowed either in "crush" seals or "radial" seal styles. Sprinklers shall be of all brass frame construction with a coated metal to metal seating mechanism.
9. Only sprinklers with integral shields listed by UL as "intermediate level" sprinklers or by FM as "racked storage" sprinklers are acceptable indoor where shield are required over ordinary sprinklers. Shop-made water shields are not allowed, nor are after market attachments designed as water shields. "Heat collection devices" for use with sprinklers shall not be allowed.

B. Protection Against Freezing
1. Horizontal dry sidewall sprinklers shall be used in lieu of antifreeze loops for narrow unheated areas adjacent to heated areas, such as docks, covered loading platforms, vehicular air locks, elevator hoistways, and gas bottle or other storage sheds.
2. The depth of the protected space shall not exceed 10 feet.
3. The dry sprinkler shall extend a minimum of 12 inches into the heated space. For refrigerated spaces, the length dry sprinklers shall extend into the heated space shall be as specified by the ARCHITECT/ENGINEER.

C. Position and Finish
1. Sprinklers installed on exposed piping shall be manufacturer's standard finish pendent sprinklers. Sprinklers and escutcheons installed below dropped ceilings shall have a finish matching the color of the ceiling tile. Only factory applied finishes shall be acceptable. If the factory has a finish that cannot match the ceiling tile color, standard finish sprinklers are allowed.

2. In rooms where sprinkler heads penetrate a suspended ceiling, only quick response, semi-recessed or recessed sprinklers are acceptable. Standard pendant sprinklers with “cup and skirt” escutcheons, one-piece escutcheons, or flush or concealed sprinklers are not allowed.
3. Escutcheons, head guards, and water shield from the supplied sprinkler manufacturer shall be used solely with the installed sprinkler. No after market escutcheons, head guards, or water shields are allowed.
4. Head guards shall be two-piece, universal attachments, bolted in place on the sprinkler. “Snap-on” one-piece units are not allowed.

2.3 PIPE

A. Pipe for installation above ground shall be metal conforming to the requirements of NFPA 13. No plastic pipe is permitted in any location whether or not permitted by NFPA. Pipe shall be listed by UL and be FM approved, and installed per its listing and approval and meet the following requirements:
1. Mechanical rolled groove pipe or cut groove pipe shall not be used at fire protection risers or for segmented arcs. Use swing jolt at locations of segmented arcs.
2. Unless otherwise specified, the minimum steel pipe wall thickness shall be Schedule 10 for pipe sizes 3 inches or larger. Pipe sizes smaller than 3 inches shall be Schedule 40. Threaded or cut groove steel pipe shall be Schedule 40 for sizes less than 8 inches and a minimum of Schedule 30 in sizes 8 inches and larger for pressures up to 300 psi.
3. Mechanical rolled groove pipe or welded pipe shall be a minimum of Schedule 10 for sizes 3 inches up to 5 inches, 0.134-inch wall thickness for 6 inches, and 0.188-inch wall thickness for 8- and 10-inch pipe for pressures up to 300-psi.
4. Steel pipe, installed for the water motor alarm line, piping from drain line valves and inspector’s test valves, dry pipe and preaction sprinkler system piping, and where pipe is exposed to outdoor weather, etc., shall be internally and externally galvanized. Galvanized fittings are required where galvanized piping is used. Any piping leading to a pressure-operated waterflow indication device shall also be galvanized. The starting point is on the alarm connection to the alarm check valve.

B. Mechanical rolled groove pipe or cut groove pipe shall not be used at fire protection risers or for segmented arcs. Use swing jolt at locations of segmented arcs.

2.4 PIPE FITTINGS

A. Pipefittings for installation above ground shall conform to the requirements of NFPA 13 and shall be FM approved or UL listed.
1. Mechanical groove couplings are required on all 4 inches and larger pipe.
2. Plain-end pipe couplings shall not be used in any new installation.
3. Galvanized pipefittings shall be installed where galvanized piping is specified.
4. Welded branch outlet fittings (weld-o-lets, groove-o-lets, etc) shall be minimum Schedule 10 for pipe sizes 3 inches or larger. Pipe sizes smaller than 3 inches shall be Schedule 40 standard wall pipe thickness. Welded outlets shall be UL listed or FM approved, affixed with the UL or FM identification stamps, and pressure rated for 300-PSI maximum.

5. Adjustable, two-piece drop nipples shall not be used. All drop nipples shall be one-piece, non-adjustable units with a minimum 1-inch diameter.

2.5 PIPE HANGERS, SUPPORTS AND SEISMIC BRACING

A. Pipe hangers, and hangar assemblies shall be UL listed of FM approved.

B. C-clamps and beam clamps shall have lock nuts and retaining straps, or clips, and pipe rings shall be of the solid-band adjustable swivel type.

C. Provide rod-ceiling plates at finished ceilings for coach screw rods, expansion shields, and toggle hangers.

D. All seismic bracing devices and flexible couplings shall be specifically UL listed or FM approved and installed per their listing or approval.

E. When fastening hangars to purlins, bolt-through fastening methods shall be used. Beam clamps with restraining straps shall not be used in any circumstance.

F. All seismic brace members shall be continuous. Under no circumstances shall members be spliced or offset.

G. Tension-only seismic bracing systems shall meet the following.
1. The tension-only system shall be UL or FM approved for seismic service, and installed in accordance with listing limitations and installation instructions.
2. A means to prevent vertical motion due to seismic forces shall be installed at the brace location.
3. Two tension only braces shall be installed in opposing directions at each brace location.

2.6 FIRE PROTECTION CHECK VALVES

A. Check valves in sprinkler system shall be UL listed or FM approved, have hand hole covers to provide adequate access to facilitate inspection and repair, without the removal of the valve from the system, and shall be listed for installation in the vertical or horizontal position. Wafer check valves are unacceptable. All check valves shall have a working water pressure of 250 PSI.

B. Alarm check valves (wet pipe, dry pipe, deluge, preaction, etc.) shall be provided on all sprinkler risers and have the following.
1. The alarm check valve (ACV) shall be equipped with a removable hand hole cover assembly and shall be listed for installation in the vertical or horizontal position.
2. The ACV shall be equipped with gauge connections on the system side and supply side of the valve clapper.
3. ACV trim piping and fittings shall be internally and externally galvanized.
4. Ported alarm connections on the ACV shall be to a retard chamber to absorb variable pressure surges.
5. Only “Flange x Flange” ACV devices shall be installed.

6. Wet-pipe systems shall use a variable-pressure alarm check valve. Plain-type check valves are not allowed. Sprinkler alarm valve shall be equipped with an external bypass to eliminate false water flow alarms.

C. Backflow prevention devices shall be installed on all sprinkler systems as follows.
1. A reduced pressure backflow prevention assembly (RPBFP) shall be installed to prevent cross-connection contamination between potable water systems and any fire sprinkler system, at the service connection for the fire sprinkler system.

2.7 FIRE PROTECTION INTERIOR CONTROL VALVES

A. Each system shall have interior control valves as follows:
1. A control valve shall be installed for isolation of each floor of multistory buildings.
2. Interstitial spaces, in-rack sprinkler systems, mezzanines, etc., shall have control valves for system isolation at the feed-main.
3. All control valves shall be provided with an electric valve supervision device, connected to the Fire Alarm System.
4. All inside control valves shall be OS&Y. Butterfly valves are not permitted. Valves shall be manufactured in accordance with AWWA Standard C500 and have a clear waterway equal to the full nominal diameter of the valve. Valves shall be provided with a handwheel, with arrow cast in metal to indicate direction of opening.

2.8 SUPERVISORY DEVICES

A. When specified on the contract drawings, supervisory devices shall be compatible with the Fire Alarm System.

B. Provide the equipment listed below.
1. Electric valve supervision switches shall be installed for all internal (inside) and external (outside) fire protection valves 2-1/2 inches or larger. The devices shall be electrical; single-pole, double-throw; with normally closed contacts and include design that signals controlled valve is in other than fully open position.
2. For wet pipe sprinkler systems, install vane-type waterflow alarm initiation devices with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts and complete with tamperproof cover that sends signal if removed.
3. All vane type waterflow alarm initiation devices shall be equipped with an adjustable delay of audible alarm initiation. Adjustment range shall be from 0 to 120 seconds. Vane type waterflow switch shall be Potter Model VSR-F or approved equal.
4. Waterflow vane-type alarm initiation devices shall be labeled as to the correct orientation of flow when mounted on system piping. When drilling of the system riser it is necessary to mount flow switch, the drilled out disc (coupon) shall be retrieved and attached to the mounting u-bolt of the flow switch.
5. Where pressure operated waterflow alarm initiation devices are used, any valve installed upstream of the device on the alarm line shall be electrically supervised, using the Potter Model BVS or approved equal. Pressure operated alarm initiation devices shall be an electrical-supervision type, waterflow switch with

retard feature. The device shall include single-pole, double-throw, normally closed contacts and design that operate on rising pressure and signals waterflow.

a) EXCEPTION: Where the waterflow alarm initiation device is used only for the purpose of an outside electric bell in lieu of the water motor gong device.

6. Any device that is to be installed in a hazardous location defined by NFPA 70 shall be rated for occupancy.

2.9 FIRE DEPARTMENT CONNECTIONS

A. Fire Department connections shall have a minimum of two 2-1/2-inch inlets with National Standard Hose (NWSH) threads, internal double clapper check valve, brass plugs, and attached chains.

B. Fire Department connections shall be installed at each new alarm check valve, dry pipe valve, deluge and preaction valve and standpipe, unless the sprinkler system is supplied by a Fire Department connection in the yard main, or as otherwise noted in NFPA 13.

C. The completed installations shall include a metal sign or escutcheon plate, with raised lettering, marked "FIRE DEPARTMENT CONNECTION STANDPIPE-AUTO S0KR," 'AUTOMATIC SPKR," or "STANDPIPE," as appropriate. Additional signs for systems such as foam water sprinkler systems or other alternative designed systems, as required by other NFPA Standards, shall also be provided by the Contractor where required.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Responsibilities

1. The Contractor is responsible for the installation of the automatic sprinkler system in accordance with these specifications and the contract drawings. The Contractor shall coordinate with architectural, mechanical, and electrical, design and construction documents, to ascertain the required information, to effect a properly designed and installed sprinkler system for the building construction and occupancy classification.
2. The installation of the automatic sprinkler system shall be complete with all necessary accessories for proper operation and shall be accomplished by a licensed sprinkler contractor or licensed company regularly engaged in this type of work, and in accordance with requirements of the National Fire Protection Association Standards (NFPA).
3. An individual with a minimum NICET Level II shall supervise the installation.
4. The fire protection system installation shall be coordinated with the other trades (mechanical, electrical and structural, etc.).
5. The installation shall comply with all mandatory, advisory interpretations, and recommended applicable rules of the latest editions of the standards listed in Section 1.3 of this document, except where otherwise noted on the drawings or specified herein.

B. Contamination and Obstruction Prevention

1. Pipe interiors shall be kept free of debris.

C. Pipe and Fittings Aboveground

1. Pipe, fittings, and hangers shall be installed where shown on the drawings and in accordance with the requirements of NFPA 13.
2. Overhead sprinkler piping, drain and test piping, fire department connection piping, etc. installed through exterior walls shall be galvanized. All sprinkler piping shall be substantially supported from building structure and only UL listed or FM approved type hangers shall be used. Sprinkler lines under ducts shall not be supported from ductwork but shall be supported from building structure (with trapeze hangers where necessary).
3. Flanged Fittings or Mechanical Groove Couplings
   a) Flanged fittings or mechanical groove couplings shall be used at the base of risers, in the risers of multiple-story sprinkler systems at each floor-system connection, and in feed main. Flanged fitting shall be used for alarm valve assemblies.
   b) A flanged tapered reducer shall be installed at the flange and spigot piece when riser is smaller than the underground supply line.
   c) Pipe shall be installed straight and true with no greater deflection at mechanical groove pipe couplings than is recommended by the manufacturer.
   d) Pipe end couplings are not acceptable.
   e) Only rigid-type mechanical couplings shall be used, unless specifically directed by NFPA 13 such as for specific seismic locations. Only in those areas identified by NFPA 13 where flexible type mechanical couplings are specified will the use of flexible couplings be permitted. All other parts of the system shall use rigid-type mechanical groove couplings.
4. Pipe Hangers and Anchors
   a) Hanger rods for all equipment, pipes, ducts, trapezes, vibration isolators, etc., shall be installed straight, true and plumb. Do not bend or flex hanger rods to accommodate sloping structures, avoid obstacles, or for any other purpose. Where necessary, utilize swivel beam clamps, beveled or swivel hardware, angled, swivel or hinged brackets spanning members or other appropriate means of connection.
   b) Offsets in hanger rods will not be permitted.
   c) Concrete anchors shall be installed by drilling and installing a UL listed or FM approved anchor. Explosive driven fasteners as a method of installing anchors or hangers shall not be permitted.
   d) Supports, hangers, braces, etc., shall be attached to the building primary structural members only.
   e) When fastening hangers or braces to bar joists, the fastener shall be located within 4 inches of the panel point on the bar joist.
   f) All piping larger than 4 inches in diameter shall be supported from a minimum of two-bar joists when run parallel to a bar joist.
5. Welded Joints
   a) Welded joints are acceptable when shop fabricated in conformance to provisions of NFPA 13.
6. Screwed Joints
   a) Teflon paste and tape shall be used as pipe-joint compound at screwed joints.
7. Bushings
   a) Bushings shall not be permitted.

8. Control Valves
   a) Control valves shall be provided with identification signs describing the areas protected. Where the valve location is concealed above the ceiling, a sign below the ceiling shall indicate the valve location and identify the protected area.
9. Wall, Ceiling, and Floor Penetrations
   a) Pipe sleeves shall be installed and properly secured in place at all points where sprinkler piping passes through concrete or masonry construction. Sleeves through all walls and floors shall provide adequate clearance for slight movement of the piping. The guidance in NFPA 13 guidance for seismic areas shall be followed.
   b) Sleeves for pipes passing through floors of concrete or waterproof construction shall project 3 to 6 inches above floors to prevent leakage. Sleeves through walls shall be cut flush with each surface unless otherwise specified. Sleeves shall be caulked to make penetration watertight.
   c) Unless otherwise specified, sleeves shall be of Schedule 40 steel and a minimum of two pipe sizes larger in diameter than the passing pipe.
   d) Holes through walls, floors, and ceilings of other than concrete or masonry construction shall be large enough to accommodate pipe expansion. Holes through existing concrete floors and walls shall be core drilled to provide clean, neat holes. Spaces between pipe and sleeve or pipe and opening for floors and exterior walls shall be filled with a non-hardening sealant material and made watertight.
   e) Where fire rated barriers are penetrated, a UL listed fire barrier system shall be installed to retain the fire resistance rating of the barrier.
   f) Escutcheons shall be provided at wall, ceiling and floor penetrations of piping in occupied areas.
10. The cutting of structural members for the passage of sprinkler piping or for pipe-hanger fastenings is not permitted.
11. Joints
   a) Joints shall be made in accordance with the requirements of NFPA 13.
   b) Joints shall be left exposed until final inspection and testing have been witnessed.
   c) Swing joints are preferred for connecting pendent sprinklers to branch lines.
12. Dielectric unions shall be used to connect dissimilar metals (such as steel to copper) to prevent electrolytic action.

3.2 SPRINKLER SYSTEM ALARM CHECK VALVES

A. Alarm Check Valves (ACV) shall be provided with internally and externally galvanized trim piping and fittings, pressure gages, a retarding chamber, water motor gong, alarm switch, testing bypass, and all necessary pipe, fittings and accessories.

B. The retarding chamber drain line shall be piped independently of the main drain line.

C. The drain line from the water motor gong shall be piped to discharge through the wall as close to the grade line as possible.

D. Piping between the ACV and a pressure actuated alarm-initiating device shall be galvanized piping not less than 3/8-inch nominal pipe size.

E. Piping supplying the retard chamber, water motor gong, and water motor gong drain shall be galvanized. Galvanized fittings are to be used where galvanized piping is required.

3.3 SPRINKLERS

A. Pendent sprinklers below ceiling shall be aligned, and parallel to ceiling features, walls, etc. In areas without a suspended ceiling, install sprinkler piping as high as possible, using necessary fittings and auxiliary drains to maintain maximum clear headroom.

B. Where two sprinkler systems abut the pendent sprinklers shall be aligned in different directions to distinguish the boundaries of each sprinkler system.

C. Sprinklers shall not be installed closer than 6 feet apart.

D. Dry pendant and horizontal dry sidewall sprinklers shall only be installed in screwed tee fittings.

E. Ceiling Areas: Where suspended ceilings are installed, the sprinkler contractor shall install pendent sprinklers as shown on the reflected ceiling plans. Where these plans do not specify the location of the pendent sprinklers, the Contractor shall obtain the reflected ceiling plans and design sprinkler locations at least six inches from ceiling tile edges, 2 feet 6 inches from HVAC supply and return louvers, dimension the locations, follow a repetitive pattern, and locate sprinklers along straight lines to the extent possible. Swing joints shall feed pendant sprinklers from 1-inch outlet tees in branch lines.

F. Stairs: Sprinklers shall be installed throughout stairways, and at every landing.

3.4 ELEVATOR SHAFTS AND MACHINE ROOMS

A. Sprinklers at the tops of all elevator shafts and in the elevator equipment rooms shall be protected from freezing.

B. Provide an OS&Y gate valve to shut off all sprinkler water flow into the elevator shaft and into the elevator machine room. Where possible, piping should be arranged such that a single valve can shut off water to both locations, and shall be at a readily accessible location, no more than 7’0” above finished floor, inside a clearly marked wall cabinet.

3.5 DRAINS

A. Two-inch drains shall be installed on all main risers and downstream of any interior sectional valves and shall be piped to drain.

B. A pressure gage cock and approved gage shall be installed downstream of interior sectional valves of 4-inch size and larger. 3/4-inch valve auxiliary drains with standard hose threads and caps shall be installed at all low points in the system, where more than five sprinklers are trapped. Where the capacity of trapped piping exceeds 20 gallons, the overflow shall be piped to drain.

C. Inspector's test connections shall be installed on each sprinkler system as near the most hydraulically remote end of the system as possible. The orifice shall be sized to discharge a flow equivalent to the smallest orifice sprinkler in the system. The inspector's test valve shall be located not more than seven feet above the floor in a visible, easily accessible location. For antifreeze systems, the orifice shall be replaced by a plugged outlet.

D. Drains shall be piped to discharge to drain, and the discharge shall be visible either by open-end or sight drain fitting.

E. Drains and inspector's test connections through outside walls shall be run through the walls as close to the floor or grade line as possible, terminating with a 45-degree galvanized elbow turned down to splash blocks.

F. Concrete splash blocks, 18” x 18” x 4” minimum in size, shall be installed under each drain or test outlet. The top of the block shall be 1 inch above grade, with a slope of 1/2 inch per foot away from the building wall.

3.6 FIRE DEPARTMENT CONNECTIONS

A. The check valve and normally open automatic ball drip (ABD) shall be located at points where they will not be subject to freezing temperatures, and the discharge from the ball drip shall be piped to drain. The ball drip shall close when the flow of water through the valve is in the range of 4 through 10 gpm. All ball drips shall be rated at 175 psi. Use valve- drains in place of automatic ball drip drains when the static head of water above the ABD will exceed 11'6". Check valves shall be UL or FM approved and shall have bodies with the UL or FM stamp.

B. The Fire Department connection shall be installed between 18 inches and 36 inches above grade.

3.7 IDENTIFICATION

A. Control, drain, test, and alarm valves and zone waterflow switches shall be provided with identification signs of the standard design adopted by the automatic-sprinkler industry, or their equivalent.

B. A hydraulic data information nameplate shall be secured to the riser with durable wire, chain, or equivalent, directly above the controlling alarm check valve and shall include the following design data.
   1. Building designation
   2. Location of remote area
   3. Design density
   4. Area of application
   5. System demand (gpm and psi at base of riser)
   6. Data shall be permanently engraved on the nameplate as follows:
      a) Material shall be durable plastic or aluminum; Minimum height of lettering is 1/8”.

C. The Contractor shall furnish and place in a plastic envelope attached to each sprinkler alarm check valve riser, one complete set of typed or printed maintenance and operating

instructions, a set of prints of the as-built working drawings and hydraulic calculations of the sprinkler system.

D. Contractor shall supply each riser with a cabinet containing maintenance and repair equipment (spare heads, wrench, etc.)

E. Each Contractor shall affix an identification tag on each system riser indicating
Name of the Contractor
Business Address of the Installing Contractor
Phone Number
24-hour emergency contact phone number

3.8 FLUSHING

A. Before connecting sprinkler systems to the main supply, each sprinkler supply line shall be flushed out thoroughly by the Sprinkler Contractor through an unrestricted opening not less than 4 inches in diameter. Minimum flowing quantities are specified in NFPA 13.

B. Failure to comply with this requirement shall necessitate flushing of the entire sprinkler system by the Contractor at no additional cost to the Owner.

C. A 4-inch temporary pipe or two 2-1/2" fire hoses shall be provided by the Contractor to discharge water to a suitable location, as designated by the ARCHITECT/ENGINEER.

3.9 TESTING

A. Aboveground Tests:
1. Prior to acceptance of the installation, the Contractor shall subject the system to the tests required by NFPA 13 for the completion of the Contractor's Material and Test Certificate. In addition, complete operating test of dry pipe, preaction, deluge, water-spray and foam water systems shall be performed.
2. Hydrostatic testing shall be performed before any ceiling is installed below the sprinkler piping. Each water control valve shall be fully opened and closed under water pressure to ensure proper operation.
3. Where sprinkler locations are roughed-in, using plugged drop nipples projecting below the level of the finished ceiling, the hydrostatic testing shall be performed two times.
    a) First, after the system is completed using the plugged drops, and before the ceiling panels are installed.
    b) Second, after the plugged drop nipples are cut to length for the finished ceiling, or replaced with other drop nipples of the correct length, and the sprinklers installed.
4. The addition of sodium silicate (also known as water-glass) and related substances before hydrostatic testing, to stop water leakage, is not permitted.
5. Pipe interiors shall be kept free of debris.

B. Alarm Testing
1. Contractor shall be responsible for testing new alarms and modified alarms installed under this contract. Defective alarms shall be replaced immediately.

3.10 PROTECTION AGAINST FREEZING

A. Sprinkler piping passing through any unheated spaces in, under, or outside buildings exposed to freezing, shall be protected as shown on the plans or in accordance with the methods specified in NFPA 13. Exposed to freezing is defined as any location where the temperature may drop below (40°F) 5°C at any time during the year.

B. Heating shall be provided for sprinkler-protected spaces in lieu of providing anti-freeze systems except where otherwise noted on the drawings or specified herein.

3.11 PROTECTION FOR BACKFLOW PREVENTION

A. A reduced pressure backflow prevention assembly (RPBFP) shall be installed on all new systems and where shown on the drawings for modifications to systems to prevent cross-connection contamination between potable water systems and any fire sprinkler system. Install the RPBFP at the service connection for the fire sprinkler system or as noted on the contract drawings.

B. RPBFP assemblies shall be either FM approved or UL listed and be approved by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California (USC-FCCHR) and the International Association of Plumbing and Mechanical Officials (IAPMO).

C. Backflow prevention assemblies used or installed under this contract shall be tested by a "Certified Backflow Control Assembly Tester" who possesses a current (within three (3) years from date of issuance) certificate that confirms successful completion of an approved training course.

D. RDBFP assemblies shall be installed in accordance with AWWA Manual M14 requirements, or as directed by the SDR.

E. If RDBFP devices will be installed outside the building they must be in heated enclosures and with adequate space for inspection, tests and maintenance.

F. Adequate drainage shall be provided for RDBFP and meet the following:
   1. Discharge shall be piped full size (of the relief valve) and extended to a drain.
   2. Discharge piping shall be sloped 1/8" per foot and be Schedule 40, galvanized.
   3. French Drains are not allowed.

G. The Contractor shall perform an operational test on any new backflow prevention assemblies used or installed under this contract.

3.12 PAINTING AND LABELING

A. Contractor shall paint those portions of fire protection as required by Painting Specification 09900. Labeling shall be as follows:
   1. Sprinkler system (e.g., inspectors tests, drain valves) shall be labeled with all information required by NFPA Standard 13.
   2. Labeling shall be accomplished with the use of permanently marked weatherproof metal or rigid plastic identification signs. The signs shall be secured with corrosion-resistant wire, chain, or other approved means. These

signs shall be provided by the manufacturer, manufacturer's representative, or installer of the sprinkler system.

3. Sprinkler riser shall be labeled with building and sprinkler system riser numbers. Labeling shall be accomplished with the use of "Brady" or approved equal self-sticking labels. The color and size shall contrast the surface that it is applied to.

3.13 DISINFECTION

A. Piping installed under this contract shall be disinfected per AWWA C651 before it is placed in operation, by using one of the following methods.

B. Continuous Feed Method

1. Place calcium hypochlorite in pipe sections when installing pipe or inject liquid chlorine into the system via the injection port. Pipe is filled with water and chlorine concentration shall remain at 10 mg/l for a minimum of 24 hours. During this time, all valves in new section will be cycled open and closed to allow for adequate disinfection. Valves connecting the new or repaired line with mains in active service shall remain closed to prevent chlorine pollution.
2. Samples shall be drawn at 1-, 4-, 8-, 12-, 16-, 20-, and 24-hour marks to determine the chlorine concentration. Acceptable tests are the N-diethyl-p-phenylenediamine (DPD) drop dilution method (AWWA C651, Appendix A) or the High Range Test Kit. The tests shall be done by the Contractor.

C. Slug Method

1. Similar to the continuous feed method. Follow AWWA C651. Chlorine concentration to be 100 mg/l for a minimum of 3 hours. During this time, all valves shall be cycled open and closed to allow for adequate disinfection. Valves connecting new or repaired lines with mains in active service shall remain closed to prevent chlorine pollution.
2. Samples shall be drawn every 15 minutes to determine concentration. Acceptable tests are the DPD drop dilution method or the High Range Test Kit. The tests shall be conducted by the Contractor.

D. Repairing or Cutting into Existing Mains

1. New interior piping surfaces shall be swabbed with a one-percent hypochlorite solution. The section being modified shall be subjected to a high chlorine disinfection process per AWWA C651. The concentration shall be a minimum of 300 mg/l for 15 minutes.
2. Samples shall be drawn before the chlorine is injected and every 5 minutes thereafter. Chlorine concentration shall be tested by the Contractor using the High Range Test Kit.

E. Flushing

1. After the lines have been chlorinated using one of the above methods, it becomes necessary to flush the lines with water until test sample indicates that the water is suitable for drinking. The residual chlorine concentration in the water is to be between 0.2 and 2.0 mg/l, as measured using a Low Range Test Kit.

F. Bacteriological Testing

1. All new and modified water lines require testing for coliform organisms per AWWA C651. The testing shall occur after successful chlorination and flushing

of the lines. Samples shall be taken from the new line in sodium thiosulfate treated sterile bottles and analyzed as specified by APHA's Standard Methods for the Examination of Water and Wastewater.

2. Results shall be recorded with the original documentation of results attached. These will be used for auditing purposes.
3. Fire protection lines will not be accepted until a negative bacteriological test is performed. Lines will be chlorinated and flushed repeatedly, until such a negative test is accomplished.

END OF SECTION

SECTION 213100

FIRE PROTECTION SYSTEM CENTRIFUGAL PUMPS

PART 1 – GENERAL

1.1 REQUIREMENTS

A. This specification deals with the installation of centrifugal pumps supplying water for private fire protection. Items considered include water supplies, suction, discharge and auxiliary equipment; power supplies, electric drive and control; acceptance tests, operation and maintenance. Pumps shall be installed in strict accordance with the requirements of the latest editions of the National Fire Protection Association, particularly Life Safety Code NFPA 101, NFPA 13, 20, 24, and 70.

1.2 RELATED SECTIONS

210000 - FIRE SUPPRESSION INDEX
210500 - GENERAL FIRE SUPPRESSION REQUIREMENTS
210513 - COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT
211300 - AUTOMATIC SPRINKLER SYSTEMS
220500 - PIPE AND PIPE FITTINGS
220523 – VALVES

SEE DIVISION 26 FOR ELECTRICAL WORK RELATED TO THIS SECTION.

1.3 SUBMITTALS

A. Shop drawing submittals shall include, but not be limited to, the following:
   1. Fire and jockey pump cut sheets with all pump capacities, UL/FM approval, pump characteristics, features and accessories clearly indicated.
   2. Pump curves with selection point clearly indicated.
   3. Fire Pump Controller and remote annunciator cut sheets with features and options clearly indicated, wiring diagrams, nameplate text and a written system operational sequence.
   4. Jockey pump controller cutsheets with features and options clearly indicated.
   5. Electrical Standards: Provide electric motors and products which have been listed and labeled by Underwriter's Laboratories, Inc. (UL) and comply with National Electrical Manufacturers' Association (NEMA) standards.
   6. Certification, Pump Performance: Provide pumps whose performance, under specified conditions, is certified by the manufacturer.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Prior to shipment of new equipment, a complete plan and detailed shop drawing describing fire pump and jockey pumps, drivers, controllers, power supply, fittings, suction and discharge connections, and water supply shall be approved by the Engineer. All equipment and materials used in the installation of Centrifugal Fire Pump System shall be UL and/or FM. approved and shall be the standard product and latest design of

manufacturer. The Contractor shall furnish eight (8) copies of shop drawings and submittal data to the Architect for review. The pump manufacturer's representative shall be responsible for the startup, test and adjustment of the complete unit assembly including controls, as indicated in "Standard for Installation of Centrifugal Fire Pumps" NFPA 20.

1. Certified shop test curves showing head capacity, efficiency, and brake horsepower of the pump shall be furnished by the manufacturer to the purchaser. The purchaser shall furnish this data to the authority having jurisdiction.

B. Pumps shall be provided with a nameplate.

C. Manufacturers: Provide products complying with these specifications and produced by one of the following:

1. Pumps:
   a. Allis-Chalmers Corporation
   b. Aurora Pump Company.
   c. Patterson
   d. Peerless
2. Fire Pump Controllers:
   a. Firetrol, Inc.
   b. Metron.

2.2 PRESSURE GAUGES

A. A pressure gauge having a dial not less than 3-1/2 in. in diameter shall be connected near the discharge casting with a 1/4 in. gauge valve. The dial shall indicate pressure to at least twice the rated working pressure of the pump, but not less than 200 psi. The face of the dial shall read in pounds per square inch with the manufacturer's standard graduations.

B. A compound pressure and vacuum gauge having a dial not less than 3-1/2 in. in diameter shall be connected to the suction pipe near the pump with a 1/4 in. gauge valve.

1. The face of the dial shall read in inches (mm) of mercury (Hg) or pounds per square inch for the suction range. It shall have a pressure range of at least twice the rated working pressure of the pump, but not less than 200 psi.

C. Circulation Relief Valve: Each pump shall be provided with an automatic relief valve set below the shut-off pressure minimum expected suction pressure. It shall provide circulation of sufficient water to prevent the pump from overheating when operating with no discharge. A 3/4 in. automatic relief valve shall be used for pumps with a rated capacity not to exceed 2500 gpm. Provision shall be made for a discharge to outside.

2.3 PIPE AND FITTINGS

A. Steel pipe shall be used aboveground and for connection to underground suction and underground discharge piping. To prevent tuberculation, suction pipe shall be galvanized or painted on the inside prior to installation, with a paint recommended for submerged surfaces. Thick bituminous linings shall not be used. Section 221000 - Water Supply Piping for piping description.

B. All provisions for welded pipe shall be in accordance with NFPA 13, "Standard for the Installation of Sprinkler Systems."

C. Suction pipe shall have a pressure rating not less than that required for yard piping. It shall be installed and tested in accordance with NFPA 24, "Standard for Private Fire Service Mains and Their Appurtenances."

D. When the suction pipe and pump suction flange are not of the same size they shall be connected with an eccentric tapered reducer in such a way as to avoid air pockets.

E. Control Valves: A listed O.S. & Y. gate valve shall be installed in the suction pipe. Butterfly valves are not permitted.

F. The discharge assembly shall consist of pipe, valves, and fittings extending from the pump discharge flange to the system side of the discharge valve. The pressure rating of the discharge assembly shall be adequate for the maximum protection system. Steel pipe with flanges (flanges welded to the pipe are preferred), screwed or mechanical grooved joints shall be used aboveground. All pump discharge pipe shall be hydrostatically tested in accordance with NFPA 13, "Standard for the Installation of Sprinkler Systems" and NFPA 24, "Standard for Private Fire Service Mains and Their Appurtenances." A listed check valve shall be installed in the pump discharge assembly. A listed indicating gate valve shall be installed on the fire protection system side of the check valve.

2.4 RELIEF VALVES

A. Where pumps are driven by constant-speed motors and the pump shut-off pressure plus the static suction pressure exceeds the pressure for which the system components are rated relief valves are required. Furnish and install a relief valve in the discharge of each pump set to open at 90 psig. Each relief valve shall be located between the pump and the pump discharge check valve and shall be so attached that it can be readily removed for repairs without disturbing the piping. Extend discharge piping to outside building in an approved manner.

B. Pressure relief valves are of two types: The spring-loaded and the pilot-operated diaphragm type.

C. The relief valve shall discharge into an open pipe or into a cone or funnel secured to the outlet of the valve. Water discharge from the relief valve shall be readily visible or easily detectable by the pump operator. Splashing of water into the pump room shall be avoided. If a closed-type cone is used, it shall be provided with means for detecting motion of water through the cone. A shut-off valve shall not be installed in the relief valve supply or discharge piping.

2.5 HOSE VALVES

A. Hose valves shall be UL and/or FM approved. The number and size of hose valves used for pump testing shall be as shown on Drawings.

B. Hose valve(s) shall have the NH standard external thread, for the valve size specified, as specified in NFPA 1963, "Standard for Screw Threads and Gaskets for Fire Hose Connections." The hose valve header shall be located outside and there is danger of

freezing, a listed indicating gate valve and drain valve or ball drip shall be located in the pipeline to the hose header.

2.6 SHOP TESTS

A. Each individual pump shall be tested at the factory to provide detailed performance data and to demonstrate its compliance with specifications. Before shipment from the factory, each pump shall be hydrostatically tested by the manufacturer for a period of time not less than 5 minutes. The test pressure shall be not less than one and one-half times the head capabilities of the maximum diameter impeller for the casing at shut-off, plus the manufacturer's maximum allowable suction head but in no case less than 250 psi. Pump casings shall be essentially tight at the test pressure. During the test, no objectionable leakage shall occur at any joint.

2.7 HORIZONTAL OR VERTICAL PUMPS

A. General: Horizontal or vertical pumps shall be split-case design. End suction pumps shall be single state, centerline discharge design manufactured to American National Standards Institute, Inc., Standard B73.1, "Specifications for Horizontal End Suction Centrifugal Pumps for Chemical Process." Pumps shall furnish not less than 150 percent of rated capacity of not less than 65 percent of total rated head. The shut-off head shall not exceed 120 percent of rated head for split-case pumps, not 140 percent for end suction pumps.

B. Fire Pump Schedule: Fire Pump Aurora Series 485 capable of 250 gpm at 50 psi discharger pressure with 30 horsepower motor at 208 volt/3 phase.

C. Fittings: Where necessary, the following fittings for the pump shall be provided by the pump manufacturer authorized representative.
   1. Automatic air release
   2. Circulation relief valve
   3. Pressure gauges
      a) The following fittings shall be provided where required or as shown on Drawings:
         1) Eccentric tapered reducer at suction inlet
         2) Hose valve manifold with hose valves
         3) Flow measuring device
         4) Relief valve and discharge cone
         5) Splash shield between pump and motor
      b) Split-case pumps which are automatically controlled shall be provided with a listed float-operated air release not less than 1/2 in. in size, to automatically release air from the pump.

D. Foundation And Setting
   1. The pump and driver shall be mounted on a common base plate and connected by a flexible coupling. The base plate shall be securely attached to a solid foundation in such a way that proper pump and driver shaft alignment will be assured. The foundation shall be sufficiently substantial to form a permanent and rigid support for the base plate. The base plate, with pump and driver mounted on it, shall be set level on the foundation. Pumps and drivers shall be aligned in

accordance with the latest edition of "Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps."

2.8 JOCKEY PUMP

A. General: Provide a complete and operational electric driven fire jockey pump and jockey pump controller as specified herein and as scheduled and as shown on the Drawings.

B. Pump:
1. The jockey pump 1-1/2 horsepower at 208 volt/3 phase shall be bronze fitted, horizontal regenerative, turbine vane type with cast iron casing, bronze impeller, stainless steel shaft, mechanical seals, grease lubricated ball-bearings and a relief valve. Jockey pump capacities shall be as scheduled on the Drawings. Pumps, casings, flanges, and mechanical seals shall be rated for operation with the working pressures scheduled.
2. The jockey pump shall be mounted on a fabricated cast iron drip lip base and shall be close-coupled to an open dripproof motor. Motor electrical characteristics and capacity shall be as scheduled or listed on the drawings.

C. Relief Valve: Provide the fire jockey pump with a factory-mounted bypass relief valve complete with piping. Set relief valve to relieve at a pressure of 25 psig above design total dynamic head to prevent motor overload and system damage.

D. Controller: The jockey pump controller shall contain a FVNR magnetic starter with 3-phase overload protection, fused disconnect, control power transformer, H-O-A selector switch and an adjustable mercury-in-tube pressure control all housed in a NEMA 1 enclosure with door mounted disconnect handle.

E. Field Service: The pump supplier shall provide pump checkout, start-up, testing and adjusting of system components and shall perform field certification testing on the installed jockey pump. The pump supplier shall also train the Owner’s Engineer in the proper operation and maintenance of the jockey pump system.

2.9 ELECTRIC DRIVE CONTROLLERS AND ACCESSORIES

A. General: This provides requirements for the installation and minimum performance of electric controllers, both automatic and non-automatic, and electric switching for electric motors driving fire pumps. Accessory devices, including alarm monitoring and signaling means are included when necessary to ensure the minimum performance of the aforementioned equipment. Motors shall be rated for continuous duty and shall not be used at voltages exceeding 110 percent of rated voltage. The pump manufacturer's representative shall supply a motor of a size compatible with duty intended. Motors shall be derated according to NEMA Standard MG1-Part 14 for use above 3300 ft. All electrical equipment shall comply with the latest provisions of NFPA 70, "National Electric Code."

B. Controllers
1. All controllers shall be specifically listed for electric motor-driven fire pump service. Any controller selected shall have a short-circuit current withstand rating at least equal to the available short-circuit current for the circuit in which it

is used. All controllers shall be completely assembled, wired, and tested by the manufacturer before shipment from the factory.

2. All controllers shall be marked "Fire Pump Controller" and shall show plainly the name of the manufacturer, the identifying designation, and the complete electrical rating. It shall be the responsibility of the pump manufacturer or a representative to make necessary arrangements for the service and adjustment of the equipment during the installation, testing, and warranty periods.
3. Controllers shall be located as close as is practical to the motors they control and shall be within sight of the motors. Controllers shall be so located or so protected that they will not be injured by water escaping from pups or pump connections. Current-carrying parts of controllers shall be not less than 12 in. above the floor level.
4. All switching equipment for manual use in connecting or disconnecting or starting or stopping the motor shall be externally operable as defined in NFPA 70, "National Electrical Code". The isolating switch shall meet requirements of this paragraph and paragraphs below. A wiring diagram shall be provided and permanently attached to the inside of the controller enclosure. All field wiring terminals shall be plainly marked to correspond with the wiring diagram furnished. Each motor control device and each switch and circuit breaker shall be marked to plainly indicate the name of the manufacturer, the designated identifying number and the electrical rating in volts, horsepower, amperes, frequency, phases, etc., as may be appropriate. The markings shall be so located as to be visible after installation. Complete instructions covering the operation of the controller shall be provided and conspicuously mounted on the controller. A manually operable motor circuit switch or a molded cast switch, either having a horsepower rating equal to the motor horsepower.
5. The motor branch circuit shall be protected by a circuit breaker, as defined in Article 100 of NFPA 70, "National Electrical Code", which shall be connected directly to the load side of the isolating means and shall have one pole for each ungrounded branch circuit conductor.
6. Alarm and Signal Devices on Controller: A pilot lamp shall be connected to a pair of power supply conductors directly on the line side of the motor starter F (load side of the circuit breaker). This lamp will indicate that the circuit breaker is closed and that power is available at the controller for starting. The lamp shall be accessible for replacement.

C. Motor Starters: The motor starter shall be of the magnetic type with a contact in each ungrounded conductor. For electrical operation of reduced voltage starters, timed automatic acceleration shall not exceed 10 seconds. Starting resistors shall be designed to permit one 5-second starting operation in each 80 seconds for a period of not less than 1 hour. The operating coil for the main controller shall be supplied directly from the main power voltage and not through a transformer.

D. Automatic Controller Accessories

1. Water Pressure Control: In the controller circuit there shall be provided a pressure-actuated switch having independent high and low calibrated adjustments. This switch shall be responsive to water pressure in the fire protection system. The pressure-sensing element of the switch shall be capable of withstanding a momentary surge pressure of 400 psi without losing its accuracy. Suitable provision shall be made for relieving pressure to the pressure-

actuated switch, to allow testing of the operation of the controller and the pumping unit.

a) The pressure sensing line connection shall be made between the pump discharge check valve and the discharge control valve. Corrosion-resistant metallic pipe or tube and fittings shall be used for the pressure sensing line. This line shall be 1/2 in. nominal size, be suitable for the system pressure, and be made of material such as brass, copper or series 300 stainless steel.

2. With pumping unit operating the control c circuits leaving or entering the fire pump controller shall be so arranged as to prevent failure to start due to fault. Breakage, disconnecting, shorting of the wires or loss of power to these circuits may cause continuous running of the fire pump but shall not prevent the controller from starting the fire pump due to causes other than these external circuits.
3. For sprinkler systems where an automatically controlled pumping unit constitutes the sole supply, the controller shall be wired for manual shutdown. Manual shutdown shall also be provided where required by the authority having jurisdiction.
4. Shutdown shall be accomplished by manual operation of reset push-button on outside of controller enclosure, which, in the case of automatic controllers, shall return the controller to full automatic position.
5. Switch Location: Special precautions shall be taken in locating the pressure-actuated switch to prevent any water leakage from coming in contact with high-voltage components.
6. The low-voltage control circuit shall be supplied from the high-voltage source through a step-down control circuit transformer protected by suitable high-voltage fuses. Its current supply shall be interrupted when the isolating switch is in the open position.
7. For these controllers, specifications differ from 4.03. A pilot lamp shall be provided to indicate that power is available. The lamp operating voltage shall be less than the lamp voltage rating in order to ensure long life. The current supply for the lamp shall come from the secondary of the control circuit transformer through resistors, if found necessary, or from a small capacity step-down transformer which shall reduce the control transformer secondary voltage to that required for the pilot lamp.

PART 3 – EXECUTION

3.1 INSTALLATION AND TESTING REQUIREMENTS

A. Installation of centrifugal fire pump shall be in strict accordance with NFPA 20 and the contract documents.

B. All equipment related to this section shall be installed and provided as described in the equipment schedule in the contract documents.

3.2 HYDROSTATIC TESTS

A. Hydrostatic tests for fire pump piping shall be in accordance with NFPA 24 “Standard for Private Fire Service Mains and Appurtenances” and flushing of the piping assembly shall be conducted in accordance with the requirements of the applicable NFPA standards for

pressure and duration. Hydrostatic tests shall be verified by completion of the Contractor's certificate of material and test similar to NFPA 13. The installing Contractor shall furnish certificate of test prior to start of fire pump field acceptance test.

3.3 PUMP FIELD ACCEPTANCE TESTS

A. The acceptance test of the pump installation shall be the responsibility of the installing Contractor. The pump manufacturer or his representative shall be present for the acceptance test. The authority having jurisdiction shall be notified as to time and place of the field acceptance test.

B. A copy of the manufacturer's certified pump test characteristic curve shall be available for comparison of results of field acceptance test. The fire pump as installed shall equal the performance as indicated on the manufacturer's certified shop test characteristic curve within the accuracy limits of the test equipment. The fire pump shall perform at minimum, rated and peak loads without objectionable overheating of any component. Vibrations of the fire pump assembly shall not be of a magnitude to warrant potential damage to any fire pump component.

C. Test Equipment: Test equipment shall be provided to determine net pump pressures, rate of flow through the pump, volts and amperes for electric motor driven pumps and speed. The test equipment shall be furnished by either the authority having jurisdiction, or the installing Contractor or the pump manufacturer, depending upon the prevailing arrangements made between the above-mentioned parties.

D. The minimum rated and peak loads of the fire pump shall be determined by controlling the quantity of water discharged through approved test devices. The quantity of water discharging from the fire pump assembly shall be determined and stabilized. Immediately thereafter, the operating conditions of the fire pump and driver shall be measured.

E. For electric motors operating at rated voltage and frequency, the ampere demand shall not exceed the product of a full load ampere rating times the allowable service factor as stamped on the motor nameplate. For electric motors operating under varying voltage, the product of the actual voltage and rated full load current times the allowable service factor. The voltage at the motor shall not vary more than 5 percent below or 10 percent above rated voltage during the test. The fire pump unit shall be started and brought up to rated speed without interruption under the conditions of a discharge equal to peak load.

3.4 CONTROLLER ACCEPTANCE TEST

A. Fire pump controller shall perform not less than 10 automatic and 10 manual operations during the acceptance test. A fire pump driver shall be operated for a period of at least 5 minutes at full speed during each of the above operations. The automatic operation sequence of the controller shall start the pump from all provided starting features. This shall include pressure switches, or remote starting signals.

B. Alarm conditions, both local and remote, shall be simulated to demonstrate satisfactory operation.

C. The fire pump shall be in operation for not less than 1-hour total time during all of the foregoing tests.

3.5 FIRE PUMP MAINTENANCE

A. A preventive maintenance program shall be established by the pump manufacturer representative in accordance with the pump manufacturer's recommendations. And provided to the user records shall be maintained on all work performed on the pump, driver, and controller.

B. Replacement components, which are of a unique or special design, shall be noted and shall be identified as being available for purchased from the manufacturer's representative.

3.6 FIELD TESTING

A. Factory Testing: The fire pump shall be factory tested and certified in accordance with NFPA 20. Certified performance test results and curves shall be delivered to the Engineer for review prior to final fire pump acceptance.

B. Field Service: The pump supplier shall provide pump checkout, start-up, testing and adjusting of system components and shall perform field certification testing on the installed fire pump. The pump supplier shall also train the Owner's Engineer in the proper operation and maintenance of the fire pump system.

C. Start-Up Services:
1. General: The pump supplier shall provide pump checkout, start-up, testing and adjusting of system components for the pump(s). The pump supplier shall also train the Owner's Engineer in the proper operation and maintenance of this pump system.
2. Checkout: After pumps have been in operation for 90 days, the contractor shall check all seals and replace any which are defective.

D. Testing:
1. General: Test and adjust all installed plumbing pumps, controllers, and annunciators to verify proper operation as specified herein and as recommended by the manufacturers. Where specified hereinabove, start-up, testing, and adjustment shall be provided by a representative of the equipment supplier.
2. Functional Tests: Test pumps, controllers, and annunciators to verify that all control, alarm and indicator functions operate properly and to verify that pump discharge pressures and flows are as specified.
3. Fire Pump Testing: Each fire pump shall be field flow tested by a representative of the manufacturer and certified in accordance with NFPA 20.

END OF SECTION

SECTION 22 0000

PLUMBING INDEX

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish all service tools, equipment, etc., which are required for the complete installation of all Plumbing Work, as indicated on the Drawings and specified herein. Plumbing work indicated on the Drawings and/or specifications covering other trades shall conform to Division 22 of these Specifications.

B. Work or equipment not indicated or specified, which is necessary for the complete and proper operation of the Plumbing systems shall be accomplished without additional cost to the Owner.

C. Furnish all labor and materials required for plumbing service connections to all the various items of equipment requiring plumbing or piping throughout the project shown on the Contract Drawings (even if not shown on Plumbing Drawings). Coordinate with other trades for the installation of required connections and service.

1.3 PLUMBING DIVISION INDEX

PART 2 – PRODUCTS

PART 3 – EXECUTION

END OF SECTION

SECTION 22 0500

GENERAL PLUMBING REQUIREMENTS

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes: General Plumbing Requirements specifically applicable to Division 22 sections in addition to Division 1- General Requirements.

B. Scope:

1. The work covered by this division consists of performing all operations in connection with the installation of heating, cooling, ventilating, and plumbing including site utility work as indicated under this section. This entire section applies to all mechanical work and all mechanical sections of these specifications. This Contractor shall read and comply with all sections of these specifications including all General and Special Conditions.

1.2 REFERENCES

A. Standard Requirements:

1. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. All work shall be executed in accordance with the local and state codes, ordinances, and regulations governing the particular class of work involved. This Contractor shall be responsible for the final execution of the work under this heading to suit these requirements. In the event of a conflict between the various codes and standards, the more stringent shall govern. Where these specifications and accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Architect/Engineer. The Architect/Engineer shall prepare any supplementary drawings required, illustrating how the work may be installed so as to comply. On approval of the change by the Architect/Engineer, the Contractor shall install the work in a satisfactory manner without additional cost to the Owner. On completion of the various parts of the work, the installation shall be tested by the constituted authorities and approved, and on completion of the work, this Contractor shall obtain and deliver to the Owner final certificates of acceptance. This Contractor shall furnish copies of each certificate to the Architect/Engineer.

C. The Contractor shall secure all permits and licenses for his work and shall pay all fees in connection with such permits and licenses.

D. The contractor shall hold and save the Owner free and harmless from liability of any nature or kind arising from his failure to comply with codes and ordinances.

E. Any and all meter deposits and all utility extension costs shall be paid by the Contractor whose work is done in connection with the service that the meter is connected to.

F. Schedule of Referenced Organizations: The following is a list of the acronyms of organizations referenced in these Specifications:

1.	AGA	American Gas Association 1515 Wilson Boulevard Arlington, VA 22209
2.	ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
3.	ASHRAE	American Society of Heating Refrigerating and Air Conditioning Engineers 345 East 47th Street New York, NY 10017
4.	ASME	American Society of Mechanical Engineers 345 East 45th Street New York, NY 10017
5.	ASPE	American Society of Plumbing Engineers 960 Illuminating Building Cleveland, OH 44113
6.	ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
7.	AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
8.	AWS	American Welding Society 2501 NW 7th Street Miami, FL 33125
9.	CISPI	Cast Iron Soil Pipe Institute 1499 Chain Bridge Road McLean, VA 22101
10.	FM	Factory Mutual System 1151 Boston-Providence Turnpike Norwood, MA 02062
11.	FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Building 197 Washington, DC 20407
12.	NBFU	National Board of Fire Underwriters 5530 Wisconsin Avenue, Suite 750 Chevy Chase, Maryland 20815
13.	NEC	National Electric Code (of NFPA)
14.	NEMA	National Electrical Manufacturer's Association 2101 L Street, NW Washington, DC 20037
15.	NFPA	National Fire Protection Association Battery March Park Quincy, MA 02269
16.	NSF	National Sanitation Foundation Box 1468

		Ann Arbor, MI 48106
17.	OSHA	Occupational Safety and Health Administration U.S. Department of Labor
18.	PDI	Plumbing and Drainage Institute 5342 Boulevard Place Indianapolis, Indiana 46208
19.	TIMA	Thermal Insulation Manufacturers Association Technical Services 1420 King Street Alexandria, VA 22314
20.	UL	Underwriters Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062

G. Underwriters Laboratories Inc. (UL): All materials, appliances, equipment, devices or appurtenances shall conform to the applicable standards of Underwriters Laboratories Inc., where such standards have been established.

1.3 DRAWINGS

A. Drawings and specifications shall be considered as cooperative, and work or materials called for by one and not mentioned in the other, or vice versa, shall be done and furnished as though treated by both.

B. In the cases of discrepancies in figures, drawings, or specifications, the Architect/Engineer shall be notified immediately and his decision shall determine the necessary adjustment. Without such decision, said discrepancies shall not be adjusted by the Contractor save only at his expense, and, in case of any settlement or any complication arising from such adjustment to the Contractor, he shall bear all extra expense involved.

C. Should it appear that the work intended to be done, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings or specifications, the Contractor shall apply to the Architect/Engineer for such further drawings or explanations as may be necessary, allowing a reasonable time for the Architect/Engineer to supply same, and the Contractor shall conform to same as part of the Contract.

D. Should any doubt or question arise in respect to the true meaning of the drawings or specifications, reference shall be made to the Architect\Engineer whose decision shall be final and conclusive. No alleged oral admission, condonation, or inadvertent neglect on the part of the Architect/Engineer will be accepted as an excuse for inferior work.

E. The mechanical plans do not give exact details as to elevations of ductwork and piping, exact locations, etc., and do not show all offsets, control lines, pilot lines, and other installation details. The Contractor shall carefully lay out his work at the site to conform to the structural conditions, provide proper grading of lines, to avoid all obstructions, to conform to details of installation supplied by the manufacturer of the equipment to be installed, and thereby to provide an integrated, satisfactory operational installation.

F. Should the particular equipment which any Bidder proposes to install, require other space conditions than those indicated on the drawings, the Bidder shall arrange for such space

with the Architect/Engineer before submitting his bid. Should changes become necessary on account of failure to comply with these details, the Contractor shall make such necessary changes at his (the Contractor's own expense).

G. The Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans which shall be checked by the Architect/Engineer and approved before the work is started, Contractor before work proceeds. Interference with structural conditions shall be corrected by the Contractor.

H. All equipment shall be installed in accordance with the manufacturer's recommendations. Provide all accessories and components for optimum operation as recommended by the manufacturer.

I. Utilities: The location, size, and pressure of utility lines are shown in accordance with the data given this office by others. As Architect/Engineers, we cannot and do not guarantee the accuracy of this data. Each Bidder shall check and verify this data. The points of connection to utility lines are approximate only and shall be verified by each Bidder prior to submitting his Bid.

J. Site visit: The Contractor shall visit the site prior to bidding and satisfy himself as the conditions under which the mechanical systems are to be installed. No subsequent allowance shall be made in his behalf for failure to make such a visit. Contractor shall examine all work noted under the demolition drawings and all new work and shall satisfy himself as to the extent of work required to be completed.

1.4 SYSTEM DESCRIPTIONS

A. Not Used.

1.5 PRIOR APPROVALS

A. Each equipment item for which the Contractor desires to install equipment other than the specific item identified in the equipment schedule or equivalent equipment by manufacturers specifically named in the schedule, the Contractor shall bear full responsibility to prove to the Engineer that the furnished equipment is equivalent to or better than the specified item. Failure to provide such proof will result in rejection of the shop drawing submittal by the Engineer. Prior written or verbal approval by the Engineer of equipment by other manufacturers will not relieve the Contractor of responsibility to provide equivalence. Prior approval is required, however, any prior approval given is intended only to provide preliminary agreement that the alternate manufacturer may make equipment that complies with the specification requirements and not that all equipment manufactured by him is acceptable.

1.6 SHOP DRAWINGS

A. Shop drawings or fully descriptive catalog data shall be submitted by the Contractor for all items of material and equipment furnished and installed under this Contract. This shall include piping, ductwork, mechanical equipment, plumbing equipment, control items, etc. The Contractor shall submit to the Architect/Engineer a sufficient number of copies of all such shop drawings or catalog data to provide him with as many review copies as he may need, plus three (3) copies for retention by the Architect/Engineer. No

materials or equipment shall be installed until officially approved by the Architect/Engineer.

B. Before submitting Shop Drawings to the Architect/Engineer for review, the Contractor shall examine them and satisfy himself that they are correctly representative of the material or equipment to which they pertain. The Contractor shall so note these Drawings before submitting them. The Contractor's review of Shop Drawings is not intended to take the place in any way of the official review of the Architect/Engineer, and the Shop Drawings which have not been reviewed by the Architect/Engineer shall not be used in fabrication or installing any work.

C. The review of Shop Drawings or catalog data by the Architect/Engineer shall not relieve the Contractor from responsibility for deviations from the plans and Specifications unless he has, in writing, specifically called attention to such deviations as the time of submission and has obtained the permission of the Architect/Engineer thereon, nor shall it relieve him from the responsibility for error of any kind in Shop Drawings. When the Contractor does call such deviations to the attention of the Architect/Engineer, he shall state in his letter whether or not such deviations involve any extra cost. If this is not mentioned, it will be assumed that no extra costs is involved for making the change.

D. After receiving approval on the make and type of materials, the Contractor shall order such materials in sufficient time so that no delay or changes will be caused. This is done to facilitate progress on the job and failure on the part of the Contractor shall render him liable to stand the expense of any and all delays occasioned by failure on this part to provide necessary details. All shop drawings shall be delivered to the Architect/Engineer's office within thirty (30) days from the date of the contract.

E. Shop drawings will be returned unchecked unless the following information is included: reference to all pertinent data in the Specifications or on the drawings, size and characteristics of the equipment, name of the project and a space large enough to accept an approval stamp. The data submitted shall reflect the actual equipment performance under the specified conditions and shall not be a copy of the scheduled data on the drawings.

1.7 SUBMITTALS

A. Submittal data shall be organized in commercial quality, three ring binders with durable and cleanable covers. Product information for each piece of equipment shall be separated by an indexing leaf with clear tabs. The product name and symbol (i.e. AHU/Air Handling Unit) shall be typed on white paper inserts and placed in appropriate tab. Complete data must be furnished showing performance, quality and dimensions. A signed review by the Architect/Engineer must be obtained before purchasing any equipment.

B. The following items shall be submitted for review by the Architect/Engineer but are not limited to:
   1. Pipe Insulation
   2. Coils
   3. Air Washer Assembly
   4. Plumbing Fixtures and Trim
   5. Cross Connection Control Devices

6. Evaporative Coolers
7. Pumps
8. Hydronic Air Control Devices
9. Plumbing Equipment
10. Heat Exchangers
11. Flexible Pipe Connections
12. Heating Terminal Equipment
13. Roof Top Equipment
14. Radiant Heating Equipment
15. Vibration Equipment and Calculations

1.8 QUALITY ASSURANCE

A. General: Comply with Division 1.

B. Welder Qualifications: Welders shall be certified by the American Society of Mechanical Engineers (ASME) National Certified Pipe for the type of work being performed. Current operators' certificates in accordance with ASME standards shall be on file at the site and shall be available to the Architect/Engineer for examination. Coupons shall be available for review by the Architect and Engineer.

C. Locations of all pipes, ducts, outlets, appliance, etc., as shown on the drawings, are approximate only and are understood to be subject to such revisions as may prove necessary or desirable at the time the work is installed. Each Contractor will be required to install his work with relation to existing building conditions and shall be entirely responsible for the correctness of his work with reference to finished elevations, etc. Piping shown on the drawings is diagrammatic only and their exact locations, depths, and invert elevations shall be as required for proper flow and coordination with other trades.

D. The contract drawing depicts graphically the arrangement of piping and ductwork. Should local conditions necessitate a rearrangement, or if any of the piping or ductwork can be installed to better advantage in a different manner, the Contractor shall, before proceeding with the work, prepare and submit three (3) copies of Drawings of the proposed arrangement for the Architect/Engineer's review.

E. If the Contractor proposes to install equipment, including piping and ductwork, requiring space conditions other than those shown, or to rearrange the equipment, he shall assume full responsibility for the rearrangement of the space and shall have the Architect/Engineer review the change before proceeding with the work. The request for such change shall be accompanied by Shop Drawings of the space in question.

F. Each Contractor is responsible for the proper location and size of all slots, holes, or openings in the building structure pertaining to his work, and for the correct location of pipe sleeves.

G. Each Contractor shall coordinate his work with that of all other trades that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipelines which require a stated grade for proper operation. Drainage lines shall take precedence over water lines in determination of elevations. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical conduit and ductwork.

H. All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Lubricate all equipment properly in accordance with manufacturer's instructions. Furnish zerk grease fittings on all greaseable bearings.

I. Equipment and Materials: The materials and equipment shall be new and shall be the standard products of the manufacturers regularly engaged in the production of Plumbing, Heating, Cooling, Ventilation, and Fire Protection Equipment, and shall be the manufacturer's latest standard design. Where two or more units of the same class of equipment are required, these units shall be the products of the same manufacturer. However, the component parts of the systems need not be the products of the same manufacturer. Specific equipment specified hereinafter is to be considered a standard of quality and operation. In general, all capacities of equipment, and motor and starter characteristics are shown in schedules on the drawings. Reference shall be made to the schedules for specific information. The capacities shown are minimum capacities. Variations in the characteristics will be permitted only on written approval of the Architect/Engineer. All equipment shall be shipped to the job with not less than a prime coat of paint or as specified hereinafter. Insofar as is possible all items of the same type (i.e., pumps, fans, etc.) shall be by the same manufacturer. Where installation instructions are not included in these specifications or on the plans, the manufacturer's instructions shall be followed. All equipment affected by altitude shall be rated to operate at the altitude where it is to be installed.

J. Excavation and Backfilling: This Contractor shall do all necessary excavation and backfill for the installation of the Mechanical systems as may be required. Curb cuts, asphalt and concrete patching, cutting and patching existing floor, etc., shall be part of this Contractor's responsibility. No extra payment will be made for rock excavation. Trenches for all underground piping shall be excavated to the required depths. The bottoms of trenches shall be tamped hard and graded to secure maximum fall. Bell holes shall be excavated to assure the pipe resting for its entire length on solid ground. Should rock be encountered, it shall be excavated to a depth of 6 inches below the bottom of the pipe, and before laying the pipe, the space between the bottom of the pipe and the rock surface shall be filled with gravel, thoroughly tamped. Pipe laid in trenches dug in fill shall be supported down in the trenches and shall be filled. No roots, rocks or foreign materials of any description shall be used in backfilling the trenches. The backfill material shall be identical to the surrounding fill material and shall be placed in 6-inch layer, wetted, and compacted to the density of the adjacent soil. See Division 2 for additional information for site utilities. All surplus materials shall be hauled from the project by the Contractor at his expense.

K. Cutting and Repairing:

1. Responsibility of the Contractor whose work is involved. Coordinate with others to prevent unnecessary cutting and repairing.
2. Lay out and locate equipment, openings, and chases. Install sleeves, inserts, and supports. Arrange with those whose work is involved to do cutting and replacing caused by negligence or error with costs reimbursed by the Contractor at fault. Cutting and replacing of existing work shall be the responsibility of the Contractor whose work is being installed.
3. Removal or terminating connections of existing work which is abandoned or replaced shall also be done hereunder to provide correct and finished work.

L. Foundations: All equipment shall be provided with suitable foundations and supports. It shall be the responsibility of the Contractor to provide for the proper locations of these foundations and supports. This applies to all rooftop equipment also.

1. All concrete foundations required by equipment furnished by the Mechanical Contractor shall be constructed by them (except where otherwise noted) the conformity with the recommendations of the manufacturer of the respective equipment, and with the approval of the Architect/Engineer. All corners of the foundations shall be neatly chamfered. Foundation bolts shall be placed in the forms when the concrete is poured. Allow 1 inch below the equipment base for alignment, leveling and grouting with nonshrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary. After removal of the forms, the surface of the foundation shall be rubbed.
2. Unless otherwise noted, foundations shall be a minimum of 6-inch high. All concrete work performed by these Contractors shall conform entirely to the requirements of the Concrete Specifications which describe this class of work.

M. Code Requirements: Comply with state and local code requirements and ordinances. Call for inspections required by responsible building inspection authority.

N. Applicable Building Codes and Ordinances: Including the latest edition of each code, but not limited to the following:

1. International Building Code.
2. Uniform Mechanical Code.
3. Uniform Plumbing Code.
4. Governing Fire Department Requirements
5. Utility Company Requirements
6. National Fire Protection Association Standards
7. NFPA 70 - National Electrical Code
8. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
9. NEPA 90B - Installation of Warm Air Heating and Air Conditioning Systems
10. NFPA 13 - Sprinkler Systems
11. NFPA 101 - Life Safety
12. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment
13. International Energy Conservation Code 2018

O. Access Panels

1. Similar to Milcor, or as noted on the drawings, size as required for concealed expansion joints, valving, gauges, balancing dampers, valves, traps, pitot stations, equipment and similar items requiring accessibility. Notify the General Contractor of each access panel location and the required size. Panels shall be proper type for ceiling or wall in which they are installed. The panels shall be furnished under this section of the Specifications, unless otherwise directed, but shall be coordinated to be compatible with walls and ceilings furnished under other sections.

1.9 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1.

B. Large Items: Make arrangements with other trades on the job for introduction into the building of equipment too large to pass through finished openings.

C. Acceptance: Check and sign for materials to be furnished by others for installation under Division 22 upon delivery. Contractor shall be responsible for the storage and safekeeping of such materials from time of delivery until final acceptance.

D. Protection: Close ends of pipe at the close of each working day during construction to prevent entry of foreign material. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Protect fixtures and equipment against damage during mechanical work with heavy paper or plastic until final clean-up.

E. Storage: Store equipment in covered enclosure or wrap with weather tight 6 mil Visqeen.

F. Shipping Protection: Protective casings, crating, and coverings to remain in place until start-up of equipment.

1.10 PROJECT CONDITIONS

A. Performance: All systems are to be rated at 6,500 ft. elevation.

1.11 SEQUENCING AND SCHEDULING

A. General: Comply with Division 1.

B. Schedule: Coordinate and order the progress of mechanical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.

C. Utility Interruptions: Schedule mechanical utility interruptions with the Architect/Engineer/Owner minimum of seven (7) days prior to the requested outage. Plan work so that duration of the interruptions a maximum of one day.

1.12 CONTROLS WIRING AND ELECTRICAL EQUIPMENT

A. All mechanical equipment controls wiring, conduit, relays, interlocks, and all accessories required for a completely operational controls system shall be the complete responsibility of the mechanical contractor. The mechanical contractor has the option to hire the project electrical contractor or any qualified controls contractor to install mechanical controls wiring and conduit. Refer to specification 251000 for installation requirements. Refer to Specification Section 253000 for coordination requirements between mechanical, electrical, and controls subcontractors.

B. Electrical items such as disconnect switches and motor starters associated with equipment provided by Division 22, when specifically mentioned to be furnished by the Mechanical Contractor, whether in these specifications or on the Electrical or Mechanical Drawings, shall be furnished by the Contractor. These items shall be mounted and connected as required for a completely operational system. See Control Systems Specification for further information.

C. All electrical equipment characteristics (voltage, etc.) must be verified by the Contractor prior to ordering. If the Contractor proposes to furnish motors varying in horsepower

and/or characteristics from those specified, he shall first inform the Architect/Engineer of the change and shall then coordinate the change with the Electrical Contractor and shall pay all additional charges in connection with the change.

D. All motors shall meet all the requirements of all Electrical Divisions.

1. All motors shall be built in accordance with the current applicable IEEE, ASA, and NEMA standards. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. All motors shall have copper windings. All motors to have minimum power factor of 85% or have switched correction to 90%. Unless indicated otherwise, motors shall be NEMA design B with a service factor of 1.15 with 40°C rise and total temperature rise of 65°C ambient and when powered from the system voltage feeding the motor. TEFC motors shall a service factor of 1.00 with total temperature is of 65°C in the above conditions. Motors located in areas exceeding 40°C ambient shall be factory-rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Type N split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 HP or less may be shaded pole induction motors.

1.13 PROTECTION AGAINST HAZARDOUS CONDITIONS

A. The Contractor shall take precautions against hazardous construction conditions at all times during construction. The final condition of the facilities shall be safe, and where safety to operating personnel is jeopardized, suitable signage shall be posted.

B. Protruding metal (bolts, steel angles, etc.) potentially hazardous to maintenance and operating personnel, shall be cut back and/or protected to reduce the risk of injury. All openings between floors shall be protected with barriers around the openings, gratings across the openings, or steel bars through the openings to avoid and protect against injury.

1.14 HAZARDOUS SIGNS

A. Equipment room contains moving or rotating parts, floor openings, or other potentially hazardous environments and shall include a sign on the door entering it that shall read similar to the following: **Hazardous Area - Authorized Personnel Only.**

1.15 OPERATING AND MAINTENANCE INSTRUCTIONS

A. The Mechanical Contractor shall furnish to the Owner a bound (three (3) ring binder) manual in triplicate, containing complete repair parts lists, and operating, service, and maintenance instructions on all mechanical equipment, fixtures, and systems, as noted below:

1. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer, Sub-consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

2. For Each Product System: List names, addresses and telephone numbers of Sub-contractors and suppliers, including local source of supplies and replacement parts.
3. Product Data: Mark each sheet to clearly identify specific product and component parts, and data applicable to installation. Delete inapplicable information.
4. Warranties and Bonds: Bind in copy of each.
5. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
6. Include color-coded wiring diagrams as installed for control system.
7. Operating Procedures: Include start-up, break-in and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.
8. Maintenance Requirements: Include routine procedures and guide for trouble-shooting, disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
9. Provide servicing and lubrication schedule and list of lubricants required.
10. Include manufacturer's printed operation and maintenance instructions.
11. Include sequence of operation by controls manufacturer.
12. Provide original manufacturer's part list, illustrations, assembly drawings and diagrams required for maintenance.
13. Provide control diagrams by controls manufacturer as installed.
14. Provide charts of valve tag numbers, with locations and functions of each valve, keyed to flow and control diagrams.
15. Provide list of original manufacturer's spare parts and recommended quantities and to be maintained in storage.
16. Include Test and Balance (T&B) Reports as specified in Section 230593.

B. The Mechanical Contractor shall also provide training as required by Section 230100 to the Owner's operation and maintenance personnel.

1.16 OPERATION PRIOR TO ACCEPTANCE

A. The Owner shall have the right to operate any and all apparatus as soon as and as long as it is in operating condition, after Owner personnel have received operational training, whether or not such apparatus has been accepted as complete and satisfactory, except that this shall not be construed to mean operations before any required alterations or repairs have been made. This operation does not indicate acceptance of the equipment by the Owner. When the Contractor enters into a contract with the Owner, he agrees to the above.

1.17 WARRANTY AND SERVICE PROGRAM

A. Due to the critical performance requirements and to clearly establish warranty responsibility for this project, the Contractor shall provide a full service maintenance and warranty program to the Owner for one full year after beneficial occupancy (substantial completion).

B. This service program shall be included as part of the base bid and shall include service, maintenance, repair, replacement, lubrication, temperature control calibration and repairs, and documenting proof for all service and maintenance work on all equipment and system furnished by the Contractor.

C. A single representative in the employment of the Contractor shall be responsible for coordination and follow through of this program. This representative's name and phone number shall be submitted to the Owner as part of the maintenance manuals and supportive data. The Contractor shall respond to a request for service with 24 hours if so requested.

D. During this first year of operation, the following sequence of maintenance service shall be performed as a minimum.
1. Clean strainers in piping.
2. Fans and/or pumps be lubricated and oiled once every four (4) months.
3. Controls shall be calibrated throughout the facility at the end of six (6) months (following substantial completion). Any leaks in the piping systems shall be repaired.
4. All equipment manufacturer's service recommendations shall be followed during this period.

1.18 FLUSHING AND DRAINING

A. It shall be the responsibility of this Contractor to properly drain and flush all ducts and pipes before use or acceptance to ensure that all debris is completely removed. Damage caused by such debris remaining in the ducts or pipes shall be repaired by this Contractor at his expense. This Contractor shall demonstrate to the Architect/Engineer's representative that all piping is clean.

1.19 CLEANING

A. This Contractor shall remove from the building construction site all rubbish and dirt as it accumulates under the contract. At completion, all areas shall be broom cleaned and all obstructions, surplus materials, etc., removed.

1.20 GUARANTEE

A. The Contractor shall guarantee all materials, equipment, and workmanship furnished and installed by him under this Contract, to be free from all defects of workmanship and materials, and shall agree to replace at his expense, without expense to the Owner, at any time within one year after installation is accepted by the Architect/Engineer, any and all defective equipment, parts, etc., that may be found. (This excludes normal maintenance and daily servicing of equipment which is the Owner's responsibility.)

1.21 FLOOR, WALL, AND CEILING PLATES

A. Where exposed pipes pass through floors, finished walls, or finished ceiling, they shall be fitted with chromium-plated escutcheons of an approved pattern. Escutcheons and plates in Mechanical Rooms do not require chrome finish.

B. This Contractor shall be responsible for providing and installing all counter flashing. All openings in the roof shall be flashed and counterflashed. Use four pound lead flashing materials for all vent lines and welded flashing in steel lines passing through roof. The Mechanical Contractor shall notify the General Contractor where each roof penetrations are and the size of the opening.

1.22 PIPE SLEEVES

A. Schedule 40 steel pipe sleeves or pipe sleeves made of No. 20 gauge galvanized steel, properly secured in place with approximately 1/4" space between each sleeve and the surface of the pipe and/or insulation passing through it, shall be provided for all pipes passing through concrete floors, roofs, and masonry walls. All pipe sleeves shall be fixed in place as the walls and floors are built up. The Contractor shall furnish and locate all sleeves and pipes passing through concrete floors, exterior masonry walls, and roofs shall be made watertight with approved non-hardening plastic material. Sleeves through pipe chase or equipment room floors shall project a minimum of 2-inch above the floor and shall be of black steel pipe with waterproof flange at center of floor thickness. Each sleeve through a fireproof wall shall be packed with approved fireproof rope in the annular space.

1.23 PIPE HANGERS

A. Pipe hangers shall be Fee and Mason of a type suitable for each use. Perforated straps shall not be used in any work. For ferrous pipes up to and including 4 inch in size, use Fee and Mason Fig. 199 malleable iron, adjustable, split ring, swivel hanger. For plumbing piping larger than 4 inch, use Fee and Mason Fig 239 steel clevis hanger. Where several pipes are parallel at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where indicated on the Drawings. For copper pipes up to and including 3 inch in size, use Fee and Mason Fig. 360 malleable iron, copper plated hangers. For copper pipes larger than 3 inch, use Fee and Mason Fig. 364 copper plated clevis hanger.

B. Hanger rod sizes shall conform to the following schedule:

1.	Pipe up to and including 2"	3/8" rods
2.	Pipe 2-1/2", 3" and 3-1/2"	1/2" rods
3.	Pipe 4" and 5"	5/8" rods

C. Unless shown otherwise on the Plans, all horizontal runs of ferrous piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following spacing:

1.	Pipe up to and including 1-1/4"	8'
2.	Pipe 1-1/2" and 2"	10'
3.	Pipe 2-1/2" and 3"	12'
4.	Pipe 3 1/2” and 4”	14’

D. Unless shown otherwise on the Plans, all horizontal runs of copper piping shall be suspended from the floor or roof construction as the case may be, by means of hangers with the following maximum spacing:

1.	Pipe up to 3/4" in size	5'
2.	Pipe 1" and 1-1/4"	6'
3.	Pipe 1-1/2" and larger	10'

E. There shall be a hanger within 2 inch of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Cast iron pipe shall have not less than one hanger per length of pipe. Vertical risers shall be supported by approved riser clamps at each floor. Vertical pipes within a space shall have not less than two supports.

F. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting, nor shall it be supported from equipment connection.

G. Expansion bolts shall be Ackerman-Johnson or Hilti.

H. Beam clamps suitable for use with this type of steel construction involved shall be Grinnell.

1.24 PRESSURE VESSEL CERTIFICATION

A. Not used.

1.25 ISOLATION

A. Excessive vibration or objectionable noise created in any part of the building by the operation of any equipment furnished and/or installed under the Mechanical Contract will be extremely objectionable and the Contractor shall take all precautions against the same by isolating the various items of equipment from the building structure and by such other means as may be necessary to eliminate all excessive vibration and objectionable noise produced by any equipment installed by them, and consequently, they shall design all foundations, supports, etc., for their equipment, and all piping with this end in view. In addition, these Contractors shall supervise the construction of all foundations and supports, whether they build them or not, in order that they may be constructed in such a manner as to prevent the transmission of objectionable noise and/or excessive vibration. Submit calculations on all vibration isolation equipment.

B. All equipment having moving parts shall be isolated from the building structure by means of Korfund isolation materials, unless specifically noted otherwise. All isolators shall be the same brand and shall be supplied from the same source. Equipment manufacturer's recommendations shall be followed in the isolation of equipment.

C. Vibration isolators shall have sufficient resilience to meet the following minimum efficiencies:

Motor HP	Equipment Room
Up to 5	90%
7-1/2 to 15	93%
20 to 40	95%
50 to 100	97.5%

D. Spring isolators shall be of the housed type with ribbed pads bonded to the underside of the baseplate or may be unhoused stable springs. Isolators shall be furnished with snubbers and limit stops where so recommended by the equipment manufacturer.

E. The Supplier of the isolating equipment shall, upon completion of the job, check all isolating materials and verify that they are installed properly, and submit a report in writing to the Architect/Engineer.

1.26 TESTING

A. Before completion of this project, the Mechanical Contractor shall test all materials and equipment which normally require testing. All piping, etc., shall be tested to meet code requirements or the Specification requirements, whichever is more stringent.

B. All equipment shall be operated sufficiently long enough to prove to the Architect/Engineer that the equipment performs satisfactorily and meets the requirements set forth on the Plans or in these Specifications.

1.27 CERTIFICATIONS

A. Before receiving final payment, the contractor shall verify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications. Submit certifications and acceptable certificates to the Architect/Engineer.

1.28 GENERAL PIPING INSTALLATION REQUIREMENTS

A. Provisions for Drainage: All piping systems shall be installed so that they may be easily drained. Drain caps, plugs, or hose bibbs shall be installed at low points. Grade piping toward drain locations.

B. Alignment: All installed pipelines shall be straight and shall remain straight against strains. Proper allowance shall be made for expansion and contraction.

C. Clean as Installed: All piping shall be kept free from scale or loose dirt when installed and must be kept clean during the completion of the installation. All openings in the piping system shall be capped or plugged while awaiting further connections. All detergents, solvents and other cleaning agents shall be compatible with the materials of fabrication of the system in which they are used. They shall not adversely affect the materials of mechanisms in the systems and they shall be acceptable to equipment manufacturers. All detergents, solvents, and other cleaning agents shall also be compatible with the process streams to be handled by the systems in which they are used.

D. Insulated Fittings: Install between any dissimilar metals such as steel and copper.

E. Expansion and Contraction: The Contractor shall make all necessary provisions for expansion and contraction with proper fittings, anchors, dresser couplings, loops, etc. Install flexible connectors on each pipe at each building expansion joint.

F. Welding: Refer to Paragraph 1.29 of this section of these specifications.

G. Bending: No bending of pipe will be permitted.

H. General: The installation shall be coordinated with respect to space available with heating, cooling, ventilating, and electrical installation. In every instance where there is a

conflict in the routing of the piping and the ducting, the routing of the ducting shall govern. Installed piping shall not interfere with the operation or accessibility of doors or windows, shall not encroach on aisles, passageways, and equipment, and shall not interfere with the servicing or maintenance of equipment. Pipe shall be cut accurately to measurements established at the construction site and shall be worked into place without springing or forcing, properly clearing all openings and equipment. Cutting or weakening of structural members to facilitate piping, installation is not permitted. Pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Piping above ground shall be run parallel with the lines of the building unless otherwise noted on the drawings. Unless otherwise shown on the drawings, horizontal piping shall pitch down in the direction of flow with grade of not less than 1 inch in 40 feet. Piping connections to equipment shall be in accordance with details shown on the drawings or as recommended by the equipment manufacturer. Service pipe valves and fittings shall be kept a sufficient distance from other work to permit finished covering not less than 1/2 inch from such other work, and not less than 1/2 inch between finished covering on the different services.

I. Installation of Valves: Valves shall be installed at the locations shown on the drawings and where specified and where directed at site. Gate valves shall be used unless otherwise shown, specified, or directed. All valves shall be installed with their stems horizontal or above. Where tight shutoff is required, a composition seat globe valve or resilient seat ball valve shall be used.

J. All valves which must be used during operation, all control valve assemblies, instrument control cases, liquid level controls, gage glasses, orifices, relief valves, and other equipment which must be observed, adjusted, or serviced during operation shall be located conveniently accessible from an operating platform or grade.

K. In general, relief valves within processing unit limits shall be located conveniently accessible from an operating platform or grade.

1. Those in non-hazardous service, such as water, shall discharge directly to outside.
2. Relief valves should have no piping between the vessel or line and the valve inlet, except as shown on the drawings.
3. Relief valves shall be installed in a vertical position. Vent piping shall be braced and supported in a manner that will not produce excessive stresses in the relief valve and will permit removal of the relief valve without necessary temporary supports for the vent lines.

L. Equipment Connections: All piping connections to pumps and other equipment shall be installed without strain at the pipe connection of the equipment. The contractor shall be required as directed to remove the bolts in flanged connections or disconnect piping to demonstrate that the piping has been so connected. Pipe connections to equipment shall be made with unions or flanged fittings. Provide removable headers for large equipment for service access.

M. Joints

1. Flanged Joints: All flanged joints shall be face matched. Raised face flanges shall not be mated to flat-faced cast-iron flanges on valves or equipment. The raised face must be turned off. All flanged bolt holes shall straddle the horizontal and vertical center line unless otherwise noted.

2. Screwed Joints: Screwed pipe joints shall have American Standard Taper Pipe Threads ANSI-B2.1 Latest Edition. Burrs formed when cutting pipe shall be removed by reaming. Care shall be taken that the inside of pipe is thoroughly clean and free of cutting oil and foreign matter before installation. Joints shall be made perfectly tight by the use of Teflon tape or approved Teflon thread sealing and lubricating compound.
3. Solder-Joints: Tubing shall be cut square and burrs removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool or wire brush before seating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Joints for serrated fittings on water, compressed air below 60 psig, and vacuum lines shall be made with a 95 percent tin and 5 percent antimony. Cored solder or solder containing lead will not be permitted.

N. Reducers: Reduction in pipe size shall be made with one piece reducing fittings. Bushings reducing at least two pipe sizes will be acceptable only when there is no room for reducing couplings or swaged nipples.

O. Unions: All piping unions shall be of the ground joint type constructed from materials equivalent in alloy composition and strength to other fittings specified with which they are used. Union Pressure classes and end connections shall be the same as the fittings used in the lines with the unions. Steel unions shall have hardened stainless steel seating surfaces on both faces.

P. Hanger Supports:
1. All hanger rods used to support piping, conduit, mechanical units, equipment, trapezes and other items shall be straight and installed plumb, regardless of length. Do not bend rods to adapt to sloped or rotated structural members, secondary support members or to sloped mounting holes on supported equipment. Contractor shall utilize available swivel, hinged, or rigid mounting techniques designed to accommodate a slope or rotation, or shall design a custom solution. Selected techniques for each application shall be submitted for approval prior to use.
2. Do not bend rods to circumvent an obstruction.
3. Loads on hanger rods shall be applied in direct tension. Do not apply compression, lateral or moment loads to hanger rods. Install bracing or additional supports to prevent hanger rod from incurring non-tension loading.
4. Do not create offsets in rods; use only in-line couplers, and only when length of coupled rod exceeds standard available length (typically 12 feet), or when full lengths cannot be placed in position. Provide additional horizontal bracing to prevent swaying of supported piping or equipment.
5. Do not straighten bent rods for subsequent use. If a rod becomes bent, cut off and discard the bent portion. Remaining straight portion of rod may be used.

1.29 WELDING

A. All welding of piping covered by this specification, regardless of condition of service shall be accompanied as follows:
1. The welding shall be in accordance with the recommendations of the American Welding Society. Mitering of pipe to form elbows, notching to form these, or any similar construction will not be permitted. Welding fittings shall be installed

on all welded lines. Joints to be welded shall be properly aligned and spaced, using special welding clamps where necessary. All welders to be employed shall have passed qualification tests prescribed by the National Certified Pipe Welding bureau (or by another reputable testing laboratory or agency) using procedures approved by the American Society of Mechanical Engineers or the American Welding Society. The welders will be required to pass qualification tests when the work of the welder creates a reasonable doubt as to his proficiency. Tests shall be conducted at no additional expense to the Owner.

2. Each welder shall, in addition to having passed the prescribed qualification tests (as noted in Paragraph 1.30.A.1), prepare sample coupons at the job site on a portion of pipe that is cut such that the cross section of the weld is open to view. The sample weld should be prepared using a 6 inch diameter pipe. The sample shall reflect a continuous weld with perpendicular cut out to show the weld in cross sectional view. This sample, when accepted and approved by a certified welding inspector, shall be used as a standard of quality to compare to other welds that this welder will be performing on the job. This same sample weld will also be a basis for accepting or rejecting the welder for working on this project. The sample weld shall be identified with a date and the welder's name and shall be kept at the site throughout the project.
3. All welding on pressure piping shall conform to all of the requirements of the American Society of Mechanical Engineers Code for Pressure Piping - B31.1 (An American National Standards Institute publication), as defined in the latest edition of the ANSI Power Piping B31.1 Manual. All welding shall also conform to all of the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. All chapters, current addenda and supplements of these manuals shall apply. This code shall be used to establish standards of performance and quality of welds. However, the Owner reserves the right to perform radiographic testing of all welds, to compare any of the welds to the approved "standard" sample welds of each welder, and to compare the welds to the welding diagrams and sketches of those recommended in the ANSI B31.1 Power Piping Manual. The intent is to obtain the highest quality welding job possible. The cost of any initial radiographic testing, for random inspection, shall be paid for by the Owner. If radiographic random testing reveals that a weld is defective, the Contractor shall bear the cost of all repairs and re-testing necessary to be made to subject weld until conformance with radiographic tests is reached. The potential for random radiographic testing and welding quality control applies to all pressure piping systems in this project, including systems below 100 psig. If a question should arise regarding the possibility of faulty welding or if there are obvious visual defects in the welding, the Contractor shall be required to correct such deficiencies to a quality level consistent with the recommendations, welding diagrams and sketches in the ANSI B31.1 Manual. The quality level shall also reflect that of the approved sample welds accomplished by each welder for this particular project.

1.30 TESTING FOR PIPING SYSTEMS

A. General: Before insulation is applied, all piping, equipment, and accessories installed under this contract shall be inspected and tested by the Contractor. All labor, material, and equipment required for testing shall be furnished by the Contractor. The Contractor shall be responsible for all repairs and retesting as required. All instruments and other equipment whose safe pressure range is below that of the test pressure shall be removed

from the line or blanked off before applying tests. Prior to performing tests, all lines shall be "blown" free of all loose dirt and foreign particles. The lines shall then be thoroughly flushed with water (liquid lines only) at a sufficient flow rate and period of time, to ensure complete cleaning of the lines of all dirt, scale, and foreign matter. Satisfactory flushing of the lines shall be subject to approval. After testing and flushing lines, all filters and strainers shall be cleaned.

B. Safety: Since the Risk of failure, with the attendant possibility of injury, is appreciable greater with further testing, all safety measures required by codes or ordinance or reasonable applicable to the situation shall be taken.

C. Concealment: Equipment or piping to be pressure tested shall not be insulated, covered, or concealed prior to that test. Compression joint underground piping may be backfilled prior to pressure test except that joints shall remain exposed until after the test, but tie rods, clamps, etc., shall be in place and fastened.

D. Pressure Ratings: These tests shall not be used to establish pressure ratings.

E. System Protection: Protect all piping and equipment against overpressure, collapse from vacuum, and hydraulic shock during the filling, testing and draining procedures. Seats of iron valves shall not be subjected to a pressure in excess of the maximum cold working pressure of the valve. Pressure tests against other closed valves shall not exceed twice the normal rating. Note that where significant differences in elevation exists, there is a risk of overpressure in the lower portions of the system in order to attain test pressure in the upper portion of the system

F. Test Temperature: Apply test pressure only after the system and test medium are at approximately the same temperature, preferably not less than 60°F. Note that some applicable codes require testing above a specified minimum temperature.

G. Sectionalizing: Systems may be separated into sub-systems for testing if such action will expedite or simplify the testing.

H. Temporary Supports: During hydrostatic testing of lines provide temporary supports to prevent overstressing supports or hangers. When tests are completed, remove all temporary supports, locks, stops, etc., and adjust supports for their cold load and alignment.

I. Testing: Domestic hot and cold water piping and heating water piping shall be tested hydrostatically at the test pressures specified and shall show no drop in pressure in a 2 hour period. Leaks shall be located by soap testing
   1. Test Pressures:
      a) Natural gas piping: as required by governing code
      b) Domestic Hot and Cold Water: 100 psig or 50% more than operating pressure, which ever is greater.
      c) Heating Water Supply and Return: 100 psig.
      d) Chilled Water Supply and Return: 100 psig.

J. Sanitary Waste and Soil System:
   1. After all soil and waste pipes and vent stacks have been installed, the outlets shall be plugged and the piping system filled with water in vertical sections to the

highest point of the system and allowed to remain filled for twenty-four (24) hours and shall prove to be leaktight under such conditions. A one inch drop will be allowed in water level in standpipe. This test may be conducted in segments as required by the sequence of construction. Contractor shall certify in writing that all test were satisfactorily completed before piping was concealed, and shall submit the certification to the Architect/Engineer for his records and for transmittal to the owner.

K. Test Report

1. A detailed report of pressure tests on piping and equipment shall be forwarded in duplicate to the Architect/Engineer. This report shall show date of test, lines tested, test medium, length of time test pressure was held, pressure drop or rise, and extent of venting or repressurizing.

1.31 COOPERATION WITH OTHER TRADES

A. The Contractor shall refer to other sections of these specifications covering the work of other trades which must be carried out in conjunction with the mechanical work so that the construction operations can proceed without harm to the Owner from interference, delay or absence of coordination.

1.32 FIELD MEASUREMENTS

A. The Contractor shall verify the dimensions covering the mechanical work at the building. No extra compensation shall be claimed or allowed on account of difference between actual dimensions and those indicated on the drawings. He shall examine the adjoining work on which Mechanical work is dependent for maximum efficiency and shall report any work which must be corrected. No waiver of responsibility for defective work shall be claimed or allowed due to failure to report unfavorable work conditions affecting Mechanical work.

1.33 SAFETY GUARDS

A. The Mechanical Contractor shall furnish and install safety guards required in order to obtain certificates of inspection from all authorities having jurisdiction. All belt driven equipment, projecting shafts, and other rotating parts shall be enclosed or adequately guarded. Provide coupling guards on all rotating shafts.

1.34 PROTECTION

A. All work, equipment, and materials shall be protected at all times to prevent obstruction, damage, or breakage. All pipe openings shall be closed with caps or plugs during installation. All equipment shall be covered and protected against dirt, water, chemical, or mechanical injury. At the completion of the work, all equipment shall be thoroughly cleaned and the entire system shall be delivered in a perfect, unblemished condition.

1.35 PAINTING AND IDENTIFICATION

A. All equipment shall be delivered to the job with suitable factory finish. Should the finish be marred in transit or during installation, it shall be finished to present a neat, workmanlike appearance.

B. Except as elsewhere hereinafter specifically required, any painting of equipment, piping, ductwork, grilles, insulation, etc., furnished and installed under this Section of the Specifications will be done by the Painting Contractor. However, the Mechanical Contractor shall leave his equipment clean and free from any grease, dirt, rust, etc., and in suitable condition for painting.

C. No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during the painting operation.

D. The piping shall be painted the basic color as indicated in other sections of these specifications and shall be marked every 10 feet on centers with Brady pipe markers. Arrows, approximately 6 inch in length and spaced about 10 feet on centers shall indicate the direction of the flow pipe. Locate additional labels as required in Mechanical Rooms. Staple in place, brush with clear lacquer. Markers shall state pipe size, flow direction, and pipe usage (such as "cold water," etc.).

1.36 RECORD DRAWINGS

A. The Contractor shall, during the execution of the work, maintain a complete set of drawings upon which all dimensional locations of equipment piping and all deviations and/or changes in the work shall be recorded. Water, storm, and drainage mains shall be delivered to the Architect/Engineer in good condition upon the completion and acceptance of the work and before final payment is made.

1.37 SUPPLIER RESPONSIBILITY

A. Each supplier, whether furnishing equipment as specified or as a substitution shall be responsible for certifying that the equipment is properly installed and that the warranty is valid. Submit written reports on the installation and the equipment performance when requested to do so by the Architect/Engineer (or his representative). Each supplier shall be responsible for furnishing qualified personnel at the job site at anytime requested by the Architect/Engineer (or his representative) during the construction or warranty periods.

END OF SECTION

SECTION 22 0523

VALVES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. All valves except lubricated plug valves and butterfly valves shall be manufactured by Nibco, Hammond, Lunkenheimer, Kennedy, Stockham, Walworth, Powell or Milwaukee.

B. Lubricated plug valves shall be as manufactured by Rockwell, Milwaukee or Walworth.

C. Butterfly valves shall be as manufactured by W.C. Norris, Centerline, Nibco, Demco, Grinell, Milwaukee or Keystone.

1.3 RELATED WORK IN OTHER SECTIONS

220000 - PLUMBING INDEX
220500 - GENERAL PLUMBING REQUIREMENTS
220523 - VALVES
220700 - PIPING INSULATION
221113 - DOMESTIC WATER SYSTEMS
221123 - NATURAL GAS PIPING SYSTEMS
221313 - SOIL AND WASTE PIPING SYSTEMS
230519 - PIPING SPECIALTIES
230548 - VIBRATION ISOLATION AND EXPANSION COMPENSATION

1.4 IDENTIFICATION OF VALVES

A. Each valve shall be provided with a stamped metal tag secured to the valve with metal chain. Tag shall indicate both the service and function of each valve. The Contractor shall furnish two prints of drawings showing floor plan for each floor with all valves accurately located and labeled. These drawings shall be neat and easily read.

PART 2 – PRODUCTS

2.1 VALVES

A. Heating water, chilled water, domestic water:
   1. Gate Valves 2" and Under: Nibco No. T134, rising stem, ductile iron hand wheel, union bonnet, solid wedge disc, bronze body, Class 150 psi working pressure.
   2. Gate Valves 2-1/2" and Larger: Nibco No. F617-0, bronze trimmed, solid wedge disc, iron body, O.S. & Y., 125 psi working pressure.

3. Swing Check 2" and Under: Nibco No. T433, swing type, Y-pattern, all bronze, renewable seat & disc, regrinding, 200 psi working pressure.
4. Swing Check, 2-1/2" and Larger: Nibco No. F938-31, iron body, bolted bonnet, Class 150, bronze trimmed, check valves installed at discharge of pumps shall be non-slam type.
5. Globe Valves 2" and under: Nibco No. T235, union bonnet, integral seat, Class 150 bronze body with renewable disc.
6. Globe Valves, 2-1/2" and Larger: Nibco No. 718-B, bolted bonnet, cast iron body, 125 psi working pressure 0.S. & Y., pattern bronze trimmed.
7. Gate Valves 3” and Under for Copper Pipe: Nibco No. S134, union bonnet, Class 150 bronze rising stem wedge disc.
8. Globe Valves 2” Under for Copper Pipe: Nibco S-235, Class 150, bronze union bonnet, integral seat, renewable seat and disc.
9. Angle Valves 2” and Under Copper Pipe: Nibco T335, Class 150, Union Bonnet, integral seat, renewable seat & disc.
10. Angle Valves 2 1/2” and Larger: Nibco F8180-B, Class 125, bolted bonnet cast iron, renewable seat & disc., bronze trim.
11. Check Valve for 3” and under for Copper Pipe: Nibco S-433, Y-pattern, swing type, all bronze, renewable seat & disc.
12. Manual Balancing Valves:
    a) 2” and Under: Nibco T-585-70 ball valve or Milwaukee Butterball butterfly valve with calibrated flow set handle.
    b) 2-1/2” and Larger: W.C. Norris butterfly valves with lever with infinite throttling position as specified below.
13. Circuit Balancing Valves: Balance Valves shall be “Circuit Setter” balance valves as manufactured by Bell & Gossett.
14. Automatic Balancing Valves: Shall be spring loaded, variable orifice type capable of maintaining present flow within 5% over an operating pressure differential of at least 14 times the minimum valve pressure requirement. Maximum controlled pressure differential shall be at least 75% of the system pump head. Valve shall be Griswold Automatic Flow Control Valve or approved equal. At Contractor’s option, automatic flow control valves may be used in 2” size and above in lieu of manual balancing valves.
15. Butterfly Valves: Lug type butterfly valves, ductile iron or cast iron body, bronze blade, stainless steel shaft and with EPT liner for tight shutoff up to 150 psi, bonded seat. Valves to be suitable for mounting between flanges, with lugs drilled and tapped so that pipeline can be disconnected with the valve still holding pressure. Valves 3” and smaller to have lever operators with infinite throttling positions. Valves 4” and larger to have worm gear and hand wheel manual operators. Butterfly valves may be used in lieu of gate valves for water service 2” and larger. Liner shall be suitable for -30 F to + 275 F.
16. Ball Valves:
    a) 1/2” to 2”: Nibco No. T-585-70, two-piece body, bronze, screwed ends, Teflon seats, straight through flow design.
17. Lubricated Plug Valves: Rockwell Mfg. Co. “Permaturn” lubricated plug valves Fig. No. 143. Provide valve handle for each valve. Valves shall have tapered plugs with thermally bonded lubricated film.
18. Water Pressure Relief Valves for makeup to heating and cooling systems, and relief for heating and cooling system, Bell & Gossett No. 1170 unless otherwise noted.
19. Drain Valves: Nibco No. T134, 3” and smaller.

PART 3 – EXECUTION

3.1 INSTALLATION

A. All valves shall be installed in locations which will allow easy operation and facilitate maintenance.

B. Gate and globe valves shall be installed with stems up.

C. System balancing valves shall be installed where shown or required to balance waterflows to all system components. In general balancing valves shall be provided at the following locations:
1. Each pump discharge, lubricated plug valve.
2. Each main branch circuit, circuit balancing valve.
3. At each water coil, circuit balance valve.

END OF SECTION

SECTION 22 0700

PIPING INSULATION

PART 1- GENERAL

1.1 SUMMARY

A. Furnish and Install:
   1. Piping insulation
   2. Jackets and accessories

1.2 RELATED DOCUMENTS:

A. The General Provisions of the Contract, including General and Special Conditions and the General Requirements apply to the work specified in this section.

B. Insulation furnished under this specification shall comply with all requirements of the State Energy Code and the recommendations of the latest edition of ASHRAE 90.1 and these specifications. The more stringent of these shall be the standard for the work provided under these specifications.

C. The work included under this specification consists of furnishing all labor, accessories, equipment and materials necessary for installation of all piping, and mechanical equipment insulation systems. This includes but is not limited to:
   1. Thermal Insulation
      a) Domestic hot water piping
      b) Heating water piping
      c) Chilled water piping
      d) Refrigerant piping
      e) Boilers
   2. Condensation Prevention Insulation
      a) Domestic cold water piping
      b) Roof drain and overflow piping and roof drains

1.3 RELATED WORK IN OTHER SECTIONS

220000 PLUMBING INDEX
220500 GENERAL PLUMBING REQUIREMENTS
230500 GENERAL HEATING, VENTILATING AND AIR CONDITIONING REQUIREMENTS

1.4 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of Guarded Hot Plate Apparatus.

C. ASTM C195 - Mineral Fiber Thermal Insulation Cement.

D. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

E. ASTM C518 - Test Methods for Steady-State Heat Flux, Heat Flow Meter Apparatus.

F. ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

G. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

H. All preformed Fiberglass pipe insulation with factory applied jackets shall meet the following standards:
ASTM E84 - Surface Burning Characteristics of Building Materials
ASTM E96 – Jacket Permeance
ASTM C335-Steady-State Heat Transfer Properties of Horizontal Pipe Insulation
ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
ASTM C547 - Mineral Fiber Preformed Pipe Insulation
ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
ASTM C795 – Thermal Insulation for use in Contact with Austenitic Stainless Steel
ASTM C1136 – Flexible Low Permeance Vapor Retarders for Thermal Insulation: Types I-IV.
NRC 1.36 – Nuclear Regulatory Commission Guide 1.36 Non Metallic Thermal Insulation
NFPA 90A
NFPA 255
UL 723 – Composite Surface Burning Characteristic
CAN ULC S102-M
MIL – I – 22344D – Insulation, Pipe, Thermal, Fibrous Glass
MIL – I – 24244C (Ships)
USCG 164.109 – Non-Combustible Materials
New York City MEA
GreenGuard Certified for Indoor Air Quality
GreenGuard Certified for Children and Schools

1.5 DEFINITIONS

A. Exposed Location: Exposed in mechanical rooms, rooms with finished walls or ceilings, and pipe chase between toilet rooms and equipment rooms.

B. Concealed Location: Located in furred spaces, attics, crawl spaces, above suspended ceilings in finished or unfinished rooms, or all other locations not exposed to view.

C. Cold Piping: Shall include domestic water and other piping with surface temperatures less than 70˚F.

D. Hot Piping: Domestic hot water, supply and return and other piping with surface temperatures greater than 105˚F.

E. Exterior Locations: All locations exposed, unexposed above grade or below grade beyond the building floor, wall or roof line of the structure or building

F. Location and Insulation Requirements:
1. Cold Water, including Non-potable Water (NPW): Insulate as follows:
   a) All piping above ceilings and in walls.
   b) Entire system except for stubouts to fixtures.
2. Domestic Hot: Insulate as follows:
   a) Entire system except for stubouts to fixtures.
3. Chilled Water Supply and Return and Heating Water Supply and Return:
   a) All piping above ceilings, drops in wall and in mechanical rooms.

1.6 SUBMITTALS

A. Comply with Section 220500.

B. Product Data: Provide product description, list of materials and thickness for each service and location.

C. Manufacturer's Installation Instructions: Indicate procedures, which ensures acceptable workmanship and installation standards will be achieved.

1.7 QUALITY ASSURANCE

A. Qualifications of Applicator: Company specializing in piping insulation application with five (5) years minimum experience.

B. Regulatory Requirements Fire Hazard Classification: Insulation shall have a composite (insulation, jacket or facing, and adhesive to secure jacket or facing) fire hazard rating as tested by ASTM E-84, NFPA 255, and UL 723 not to exceed 25 flame spread, 50 fuel contribution, and 50 smoke developed. Materials shall be labeled accordingly.

1.8 DELIVERY, STORAGE AND HANDLING

A. Compliance: Comply with Section 230500. Deliver materials to job site in original non-broken factory packaging, labeled with manufacturer's density and thickness and store in a warm, dry location.

1.9 PROJECT/SITE CONDITIONS

A. Storage Environment: Maintain ambient temperatures and conditions required by manufacturers of adhesive and insulation while in storage.

B. Environmental Requirements: Perform work at ambient and equipment temperatures as recommended by the insulation manufacturer.

C. Protection: Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Repair or replace any such insulation or covering damaged prior to final acceptance of work.

D. Application Surfaces: Surface shall be dry, free of dust, oil, construction residues or other foreign materials before insulation is applied. Piping joints shall be dry, leak free and tested before application of insulation occurs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. Owens-Corning
2. Knauf
3. Johns Manville
4. Industrial Insulation Group

2.2 MATERIALS

A. Glass Fiber:
1. Insulation: ASTM C547; rigid molded, noncombustible.
a) 'K' value: ASTM C335, 0.24 at 75 °F
1) K values shall conform to the following at 75°F
(a) Heating water to 250°F: .28
(b) Heater water and Steam to 350°F or above: .32
(c) Chilled water 40°F to 55°F: .24
(d) Domestic water 105°F or greater: .24
b) Minimum Service Temperature: -20□F
c) Maximum Service Temperature: +450□F
d) Maximum Moisture Absorption: 0.2 percent by volume
2. Vapor Barrier Jacket:
a) All Service Vapor Retarder Jacket
b) Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
c) Secure with self sealing longitudinal laps and butt strips.
d) Alternate: Paper Free All Service Vapor Retarder Jacket

2.3 JACKETS

A. A.PVC Plastic
1. Jacket: ASTM C921, One piece molded type fitting covers and sheet material, off white color.
a) Minimum Service Temperature: -40□F
b) Maximum Service Temperature: +150□F
c) Moisture Vapor Transmission: ASTM E96; 0.002 percent by volume
d) Maximum Flame Spread: ASTM E84: 25.
e) Maximum Smoke Developed: ASTM E84; 50
f) Thickness: 20 mil.
g) Connections: Brush on welding adhesive

2. Covering Adhesive Mastic: Compatible with insulation
3. Acceptable Manufacturers
   a) Proto
   b) Zeston
   c) Speedline

B. Canvas Jacket; UL listed.
1. Fabric: ASTM C921, 6 oz/sq yd, plain weave cotton treated with dilute fire retardant lagging adhesive.
2. Lagging Adhesive: Compatible with insulation.
3. Aluminum Jacket: ASTM B209.
   a) Thickness: 20 mil inch sheet.
   b) Finish: Smooth.
   c) Joining: Longitudinal slip joints with 2 inch laps.
   d) Fittings: 0.016 inch thick die shaped covers with factory attached protective liners.
   e) Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

C. Aluminum Jacket: ASTM B209
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

D. Stainless Steel Jacket: Type 304 stainless steel.
1. Thickness: 0.016 inch
2. Finish: Smooth
3. Metal Jacket Bands: 3/8 inch wide; 0.016 inch thick stainless steel.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Inspect work in conformance with Section 220500.

3.2 PREPARATION

A. Pipe Testing: Testing of piping shall be completed and leaks repaired prior to application of insulation. Surfaces shall be clean and dry before proceeding.

B. Installation: Install materials after piping has been tested and approved. See Section 220500.

C. Surface Cleaning: Clean surfaces for adhesives.

3.3 INSTALLATION

A. Pipe Insulation:

1. Manufacturer's Instructions: Install materials according to manufacturer's instructions.
2. Finished Surface Temperature: Insulation thickness shall conform to those recommended ASHRAE 90.1, latest edition, unless otherwise specified. Thickness of insulation shall be sufficient to keep surface temperatures below 115˚F.
3. Continuity: Apply insulation tightly over clean, dry surfaces with sections or edges firmly butted together. Make insulation continuous through sleeves or openings in walls and floors.
4. Make insulation continuous at pipe hangers, trapezes, and other types of supports. Do not notch insulation to fit over hangers, trapezes, and other supports. Install shields at all supports.
5. Name Plates: Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.
6. Supports: Finish insulation neatly at hangers, supports and other protrusions. Locate insulation or cover seams in least visible locations.
7. Inserts: Provide an insert, not less than 6-inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2-inches diameter or larger, to prevent insulation from compressing at support points. Inserts shall be cork, hardwood or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used with field fabricated insulation value equal to insulation approved by the Project Engineer. Do not use calcium silicate inserts or other material that can absorb moisture on any below ambient piping system.
8. Enclosures: Do not insulate hot water heating pipe within radiation enclosures.
9. Flanges: On insulated piping without vapor barrier and piping conveying fluids 140°F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation at such locations.
10. Equipment Fittings and Valve Coverings: Insulate all equipment, fittings and valves. Terminate insulation neatly with insulating and finishing cement troweled on bevel.
11. Preformed Fittings Locations: All fittings and valves shall be insulated with preformed fiberglass for fittings, mitered sections of pipe insulation or fiberglass blanket insulation of equal thickness to the adjacent pipe insulation. Cover the fittings, valves and insulation with preformed PVC jacket. Close jacket with stainless steel tacks and compatible adhesive.
12. Radiation Barrier: When insulating hot pipe fittings, a layer of kitchen-type aluminum foil shall be applied over the first fiber glass insert applied, making sure the aluminum foil is extended over the adjacent pipe insulation. A second fiber glass insert shall then be applied over the foil with a vapor seal at all the aluminum foil edges. Insulation thickness shall be such that the surface temperature shall not exceed 115˚F.
13. Expansion Devices: On insulated piping with vapor barrier; insulate all equipment, fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

14. Fasteners: Avoid the use of staples on vapor barrier jackets. Seal vapor barrier penetrations with white vapor barrier finish and adhesive.
15. Adhesive Limitations: Apply adhesives to not exceed the coverage recommended by the manufacturer.
16. Wall, Floor and Ceiling Penetrations: Continue insulation with vapor barrier through penetrations including walls, floors and ceilings.
17. Enclosure: All insulation ends shall be firmly butted and secured with minimum 3 inch wide butt strips. Exposed end of pipe insulation shall be sealed with vapor barrier mastic.
18. Repairs: Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.
19. Service Access: When equipment with insulation requires periodical opening for maintenance, repair, or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage.
20. Unless preinsulated pipe is used, all insulation below grade shall be polyurethane spray foam covering suitable for use in wet environments without degradation. Piping shall be supported by a rigid styrofoam board 4 inch thick which exceeds the width of the pipes laid in the trench parallel to the pipe. All pipes shall be wrapped with two wraps of 1 1/2 inch thick fiberglass blanket before spraying. Spray foam shall be applied to assure a 2 inch MINIMUM coverage. Insulation shall be coated with Deer-O Foam Cap W-256 applied at the rate of one gallon per 100 square ft. or vapor barrier protection with a perm rating of 0.0019.
21. A complete moisture and vapor seal shall be provided on cold surfaces where vapor barrier jackets or coatings are required. Anchors, hangers and other projections shall be insulated and vapor sealed to prevent condensation. For heat traced piping, insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
22. Insulation shall be installed in a workmanlike manner by workmen regularly engaged in this type of work. Insulation shall not be applied until all surfaces are clean and dry and until inspection and release for insulation application.
    a) Do not notch insulation to fit around trapezes or wall-mounts fabricated from slotted metal framing (“unistrut or equal”), angle iron or other materials. Insulation shall be continuous across the support and an insulation shield shall be installed to prevent crushing the insulation. Pipe clamps shall be sized to fit around insulation and shield.
    b) Insulation may be notched or trimmed around riser clamps. Seal exposed insulation.

B. JACKETS:
1. Indoor, Concealed Applications: Insulated pipes conveying fluids above ambient temperature shall have standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish fittings, joints, and valves with premolded PVC jackets secured with stainless steel tacks. The precut insulation shall be held in place by copper wire or hemp twine and be removable without damage to the insulation or jacket. Leave surfaces clean and ready for painting.
2. Indoor, Concealed Applications: Insulated dual-temperature pipes or pipes conveying fluids below ambient temperature shall have vapor barrier jackets,

factory-applied or field-applied. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe, and finish with premolded PVC jackets.

3. Indoor, Exposed Applications: Mechanical Equipment Rooms, all insulated piping to be finished with aluminum jacket secured with metal jacket bands.
4. Indoor, Exposed Applications: Same as Indoor, Concealed Applications except that in addition the insulation shall be covered with an aluminum jacket secured with metal jacket bands.
5. Exterior Applications: Same as Indoor, Exposed Applications plus connect with a modified S lock equal to Premetco "Loc-Jack" Z-Crimp, Factory or Field installed. All seams shall be sealed with silocone caulking and have seams oriented so that the jacketing will shed water & not tend to trap and enter rainwater.

3.4 APPLICATION

A. Fittings and Valves Insulation:

1. Premolded Fittings: All insulated pipe fittings shall be insulated with 20 mil PVC Zeston one piece premolded insulated fittings wherever possible. If Zeston fittings are not available for the use required, comply with the following paragraph #2. Insulate fittings with fiberglass tightly wrapped with copper wire or heavy hemp twine to within 1/4 inch of thickness of adjoining copper wire or insulation, finished with 1/4 inch of insulating cement troweled flush with pipe insulation. A tack coat of mastic vapor barrier Foster 60-25 or 26 to 1/16 inch thickness or equal shall be applied to fittings and valves. Apply 6 oz. fiberglass canvas jacket to build-up (not PVC) fitting band valve insulation. Cement laps thoroughly with Foster 81-42 or 30-36 adhesive.

B. Perm Rating Vapor Barrier Mastic Coatings:

1. Perm rating not more than 0.25 when tested in accordance with ASTM E-96, Procedure A Fire Retardant.

C. Adhesives, Sealers, Facings, and Vapor Barrier Coatings:

1. Compatible with materials to which applied, and shall not corrode, soften, or otherwise attach the pipe or insulation materials in either the wet or dry state. Use only adhesives, sealers, facings, and vapor barrier coatings recommended by the approved manufacturers of insulation materials.

3.5 SCHEDULE

Service	Pipe Size	Thickness
CW, HW, HWC	All sizes CW, 1/2 inch to 2 inch HW, HWC	1 inch
	2-1/2 inch and Larger HW, HWC	1-1/2 inch
NPW & Cooling Condensate	All sizes	1 inch
HWS, HWR CHWS, & CHWR	All sizes	2 inch

END OF SECTION

SECTION 22 1000

PIPE AND PIPE FITTINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 SCOPE

A. This section of the specifications encompasses the basic materials and methods of the various piping systems covered in Division 25.

B. Standards: The latest edition of each standard referenced shall be used to determine compliance.

1.3 RELATED WORK IN OTHER SECTIONS

220000 - PLUMBING INDEX
220500 - GENERAL PLUMBING REQUIREMENTS
220523 - VALVES
220700 - PIPING INSULATION
221113 - DOMESTIC WATER SYSTEMS
221123 - NATURAL GAS PIPING SYSTEMS
221313 - SOIL AND WASTE PIPING SYSTEMS
230519 - PIPING SPECIALTIES
230548 - VIBRATION ISOLATION AND EXPANSION COMPENSATION
232113 - HYDRONIC PIPING SYSTEMS

1.4 IDENTIFICATION OF PIPING

A. All accessible piping shall be labeled at not more than 10 ft. intervals with labels indicating the service and direction of flow. Pipe labels shall be self-adhesive labels, all-temperature Perma-Code pipe markers No. B-500, manufactured by the W.H. Brady Company. The background color code for all markers shall conform to the American National Standard A13.1 - 1975 "Scheme for the Identification of Piping Systems."

B. The color red shall be for the exclusive use on fire protection service piping and sprinkler piping per OSHA regulations (CFR 1910.144).

PART 2 – PRODUCTS

2.1 PIPING SYSTEMS

A. Exterior Water Distribution
   1. Copper: Type K hard, seamless copper tube conforming to ASTM B-88 with silver brazed joint per ASTM B260 Class BAg-1 with wrought copper fittings per ANSI B16-22.

B. Domestic water system
   1. Above grade:
      a) Copper: Shall be Type K soft drawn, or Type L hard drawn, seamless copper tubing conforming to ASTM B88, with wrought copper and bronze solder joint pressure fittings conforming to ANSI B16.22.
   2. Underground:
      a) Copper: Type K hard, seamless copper tubing conforming to ASTM B-88 with silver brazed joints (ASTM B-260 Class BAg-1) with wrought copper fittings per ANSI B16.22.

C. Soil and waste system
   1. Above ground:
      a) Cast Iron: Shall be cast iron hub and spigot soil pipe or hubless cast iron pipe and fittings, (No-Hub Couplings shall conform to CISPI Standard 310 & ASTM A-1277 or latest edition) conforming to ASTM A74 (latest edition) and/or Cast Iron Soil Pipe Institute (CISPI) CS-888 and shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. The hub and spigot pipe shall use compression gasket joints per ASTM C-564 & ASTM 1563.
   2. Underground inside building:
      a) Cast Iron: Shall be cast iron hub and spigot soil pipe or hubless cast iron pipe and fittings, (No-Hub Couplings shall conform to CISPI Standard 310 & ASTM A-1277 or latest edition) conforming to ASTM A74 (latest edition) and/or Cast Iron Soil Pipe Institute (CISPI) CS-888 and shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. The hub and spigot pipe shall use compression gasket joints per ASTM C-564 & ASTM 1563.

D. Sanitary vent system
   1. Vent piping 2" and smaller in diameter may be schedule 40 galvanized steel pipe conforming to ASTM A-53 with 150 pound galvanized malleable iron screwed fittings conforming with ANSI B16.3. Vent piping larger than 2" shall be cast iron as specified for interior soil and waste.

E. Refrigeration piping system
   1. COPPER: Shall be "ACR" Type L hard drawn, seamless copper tubing conforming to ASTM B280, with wrought copper and bronze solder joint pressure fittings conforming to ANSI B16.22.

F. Heating water and chilled water and condenser water systems
   1. Copper: Shall be Type K soft drawn, or Type L hard drawn, seamless copper tubing conforming to ASTM B88, with wrought copper and bronze solder joint pressure fittings conforming to ANSI B16.22.
   2. Galvanized steel: Shall be schedule 40, galvanized steel pipe conforming to ASTM A-53 with 150 pound galvanized malleable iron screwed fittings conforming with ANSI B16.3.
   3. Black steel: Shall be Schedule 40, black steel pipe conforming to ASTM A-53. Fittings 2" and smaller shall be 250 pound malleable iron screwed fittings conforming with ANSI A-197. Fittings 2 1/2" and larger shall be scheduled 40 weld fittings per ASTM A-234. Flanges shall be 150 pound slip-on or wild neck types, flat faced, per ASTM A181, Grade 1.

G. Natural gas piping system
1. Black steel: Above grade piping shall be Schedule 40, black steel pipe conforming to ASTM A-53, with 150 pound malleable iron screwed fittings conforming with ANSI B16.3. or seamless carbon steel weld fittings conform to ASTM A-234.
2. Underground piping shall be schedule 40 black steel pipe conforming to ASTM A-53 machine wrapped with Scotchwrap PVC tape using 50% overlap. Fittings and joints shall be double wrapped to a minimum 6 inches beyond the fitting. Pipe shall be primed prior to wrapping per manufacturer's recommendations.

H. Preinsulated piping systems
1. Chilled water: The pre-insulated piping system shall consist of a Schedule-40 polyvinyl-chloride-plastic pipe that meets the requirements of National Sanitation Foundation Standard No. 14, a sealed PVC-plastic jacket with polyurethane-foam insulation completely filling the annular space between the pipe and the jacket. Joints shall be made using bell-and-spigot type joints utilizing a gasket ring. Jackets ends shall be sealed with factory installed watertight end seals. Piping shall be equal to Chill-Guard as manufactured by Ric-Wil. All joints shall be insulated and sealed with factory supplied units.

2.2 JOINTS

A. Copper:
1. Silver brazed joints shall use brazing material containing approximately 45% silver, 15% zinc, 25% cadmium and 15% copper. Joints shall conform to ASTM B-260 Class BAg-1. Approved materials include Mueller #122, Handy and Harmon "Easy Flo45" and United Wire and Supply "Sil-Bond 45".

B. Cast Iron:
1. Neoprene Rubber gaskets for hub and spigot piping per ASTM C564.
2. No hub joints shall consist of couplings that conform to CISPI 301.

C. Ductile Iron: Joints shall be of the stuffing box type per ANSI 21.11 as modified by ANSI 21.51 or push-on type per ANSI 21.51. Rubber gaskets and lubricant shall be per ANSI 21.11.

D. Black Steel:
1. Screwed joints shall be made with no more than three threads showing using teflon tape or teflon joint sealing compound.
2. Welded joints shall be fusion welded to full metal depth with width at least 2 1/2 times the depth of the metal being joined.

E. Galvanized Steel:
1. Screwed joints shall be made with no more than three threads showing using teflon tape or teflon joint sealing compound.

F. Reinforced Concrete Pipe: Joints shall be rubber gasket type using a bell and spigot design of steel. Gaskets shall conform to AWWA C300, C301 or C303.

G. Bell and spigot joints shall conform to AWWA C200 with rubber gaskets.

H. Bonded joints shall have metallic bond including joints made with flexible couplings, caulking or rubber gaskets. Metallic bond shall be of ferrous material to effect continuous conductivity. Bond wire shall be type RHW-USE, size 1/0 neoprene gasketed copper conductor. Bond shall be thermal weld type.

I. Insulating joints shall be installed between nonthreaded ferrous and nonferrous metallic pipe. Insulating joints shall consist of a sandwich type flange insulating gasket of the dielectric type, insulating washers and insulating sleeves for flange bolts. Gaskets shall be full faced. Bolt insulating sleeves shall be full length. Units shall be of a construction to prevent metal to metal contact of dissimilar piping materials.

2.3 FLOOR, WALL AND CEILING PLATES

A. Where exposed pipes pass through finished floors, finished walls or finished ceilings, they shall be fitted with chromium plated spun brass flanges or flanges to match the type of pipe or pipe finish used. Plates shall be large enough to completely close the hole around the pipe and shall be not less than 1-1/2" or more than 2-1/2" larger than the diameter of the pipes. All plates shall be securely held in place.

2.4 UNIONS

A. Piping 2-1/2" and larger to have bolted flange unions with gaskets of material suitable for the specified service. Ground joint unions with brass to iron seats shall be used in piping 2" and smaller. Unions shall be installed at all valves and equipment connections.

B. Insulating Unions: See Specification Section 230519.

2.5 HANGERS AND ANCHORS

A. To prevent galvanic action between copper pipe and a dissimilar metal, copper pipe shall be isolated to prevent the pipe from contacting the dissimilar metal. This may be accomplished by mounting the pipe in an isolation fitting, or by wrapping the pipe with a 20-mil thickness of UPC-rated isolation tape. The 20-mil thickness can be accomplished by using a single wrap of 20-mil tape or by using 10-mil tape with a 50% overlap.

B. Copper pipe does not need to be isolated from copper plated pipe hangers that are suspended from hanger rods.

C. Copper pipe mounted on slotted metal framing (“unistrut or equal”), angle iron, or other dissimilar metal support shall be isolated as described above, even if pipe clamps used are copper plated. Painted, epoxy or powder-coated finishes on the metal support are not an acceptable means of isolation.

D. All piping shall be rigidly supported from the building structure by means of adjustable ring type hangers. Where pipes run side by side, support on rod and angle trapeze hangers. Hangers shall be spaced not greater than 5 feet on centers for cast iron piping, 6 feet on centers for copper piping and 10 feet on centers for steel piping. Plastic pipe shall be supported on not more than 3 feet centers. Round rods supporting the pipe hangers shall be of the following dimensions:

1.	1/2 inch to 2 inch pipe	3/8 inch rod
2.	2-1/2" inch to 3 inch pipe	1/2 inch rod

3.	4 inch to 5 inch pipe	5/8 inch rod
4.	6 inch pipe	3/4 inch rod

E. Rods for trapeze hangers shall be a minimum of 3/4 inch and shall have the equivalent cross section listed above per pipe supported. The use of pipe hoods, chains, or perforated iron for pipe supports will not be permitted. Insulated piping shall have hangers outside of insulation with 18 ga. protection sleeves 12" long. Anchors and guides shall be as detailed on the drawings. The Contractor shall provide inserts in the building construction at the time the concrete is poured, and the hangers shall be attached to these inserts. Where inserts cannot be used expansion shields may be used provided the hanger is not attached rigidly to the bolt but is supported from an angle held in place by the expansion bolt. The use of expansion shields must be approved by the Architect/Engineer. See drawings and details for support of tunnel piping.

F. Hanger rods for all equipment, pipes, ducts, trapezes, vibration isolators, etc., shall be installed straight, true and plumb. Do not bend or flex hanger rods to accommodate sloping structures, avoid obstacles, or for any other purpose. Where necessary, utilize swivel beam clamps, beveled or swivel hardware, angled, swivel or hinged brackets spanning members or other appropriate means of connection.

PART 3 – EXECUTION

3.1 GENERAL

A. Provide and erect in a workmanlike manner according to the best practices of the trade all piping shown on drawings and required for the complete installation of the systems. The piping shown on the drawings shall be considered as diagrammatic for clarity in indicating the general run and connections and may or may not in all parts be shown in its true position. The piping may have to be offset, lowered or raised as required or as directed at the site. This does not relieve the Contractor from responsibility for the proper erection of systems or piping in every respect suitable for the work intended as described in the specifications and approved by the Architect/Engineer.

B. In the erection of all piping, it shall be properly supported and proper provisions shall be made for expansion, contraction and anchoring of piping. All piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing or forcing, properly clearing equipment and all windows, door, and other openings. Cutting or other weakening of the building structure to facilitate installation will not be permitted. All pipes shall have burrs and/or cutting slag removed by reaming or other cleaning methods. All changes in direction shall be made with fittings.

C. Preinsulated Piping Systems

1. All piping adjoining this system shall be anchored at or near the point of connection to avoid imposing any external forces on the carrier pipe. The Contractor shall pour concrete anchor blocks at every change of direction after testing the pipe. The anchor blocks are to be sized in accordance with forces resulting from thermal stress, existing soil conditions, and shall be in accordance with the manufacturer's recommendations.
2. Immediately after the system is installed in the ditch, a partial backfill of selected earth shall be made in the middle of each unit, leaving the joints exposed for

inspection of the hydrostatic test. A hydrostatic test of 200-psig shall be required for a period of four hours. No leakage shall be allowed.

3. After hydrostatic testing, final backfill of selected earth shall be hand placed and hand tamped to 12" minimum over the top of the jacket. Remainder of the backfill shall be free of large boulders, rocks over 6" in diameter, frozen earth, or foreign matter. The backfill operation shall now be completed by any convenient means. Do not use wheeled or tracked vehicles for tamping.
4. The services of a factory-trained Field Service Instructor shall be required, and materials shall be stored, handled and installed in accordance with Manufacturer's recommendations. The Field Service Instructor shall be present during critical stages of the installation and testing.

D. All open ends of pipes and equipment shall be properly capped or plugged with plugs manufactured for this purpose to keep dirt and other foreign materials out of the system. Plugs of rags, wool, cotton waste or similar materials may not be used in plugging.

E. All piping shall be arranged avoiding interference with removal and maintenance of equipment, filters or devices; and not blocking access to manholes, access openings, etc. Flanges or unions as applicable for the type of piping specified shall be provided at the piping connections to all items of equipment.

F. Valves and specialties shall be placed to permit easy operation and access, and valves shall be regulated, packed and adjusted at the completion of the work before final acceptance.

G. All piping shall be erected to insure proper draining. Domestic water piping may be run level but shall be free from traps.

H. Soil and waste piping and other gravity drains shall be sloped down in direction of flow minimum one inch in 20 feet.

3.2 ACCESS DOORS

A. Furnish all access doors required for access to valves, controls, or other items for which access is required for either operation or servicing. All costs incurred through failure to perform this function as the proper sequence of the work dictates shall be borne by this Mechanical Contractor.

B. The type of access door shall be as required by the room finish schedule. Acoustical tile access doors shall be equal to Krueger Style B, Style A for acoustical plaster, or Style C-CF for sidewall drywall or plaster construction.

3.3 JOINTS

A. Resilient molded gaskets shall be used on hub and spigot piping. For cast iron soil pipe not located under buildings, the Contractor may also use the No-hub sanitary system for pipe 6" and below with neoprene sealing gaskets, stainless steel retaining sleeves and two draw bands. An adequate torque wrench shall be used for system installation in accordance with manufacturer's recommendations.

B. Screwed Joints: Screwed joints shall be American Standard taper pipe threads. Ream pipe ends and remove burrs after threading. Make up joints using an approved compound or teflon tape, applied to the male threads only.

C. Brazed and Soldered Joints: Tubing shall be cut square and burrs removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections.

D. Welded Joints: On black steel piping 2 inches and above in size, the joints shall be welded. Welding shall be done using either gas or electric welding equipment. Certified welders shall be used. All pipe surfaces shall be thoroughly cleaned before welding. Each joint shall be beveled before being welded. Piping shall be securely aligned and spaced and the width of circumferential welds shall form a gradual increase in thickness from the outside surface to the center of the weld. The Contractor shall use appropriate materials to protect the structure and provide adequate fire protection at all locations where welding is done. All elbows shall be long radius unless otherwise specified. Wherever tee connections are made to piping systems on the main run, welding sockets may be installed for the branch connections up to one half the size of the main run. On connections larger than one half the size of the main run, welding tees shall be used. The use of fittings formed from welded pipe sections will not be permitted.

E. Flanged Joints:
1. Cast iron flanges shall conform to the American Standard for cast iron pipe flanged fittings, Class 125 (B.16.1). Gaskets shall be suitable for the service on which used.
2. Steel flanges shall be 150 lb. raised face type.

F. Solvent Welded Joints:
1. Pipe shall be cut square with pipe cutters designed specifically for plastic pipe. Pipe shall be protected from serrated holding devices and abrasion. Remove burrs from inside and outside of pipe. Clean the joining surfaces using an approved ABS Cleaning compound. Following the instructions on the can, apply the ABS cement and assemble the joint as quickly as possible before the cement dries.

3.4 PUMP AND EQUIPMENT CONNECTIONS

A. All piping connecting to pumps or other equipment shall be installed with isolation valves and flexible connections to prevent strain at the connection to equipment. The Contractor shall be required as directed to disconnect piping to demonstrate that piping has been so connected. Provide a suction diffuser at each end suction pump where the inlet piping has a straight run of less than 15 pipe diameters in length. Suction diffusers shall consist of angle type body with inlet vanes and combination diffuser-strainer-orifice cylinder with 3/16 inch diameter openings for pump protection. Strainer free area shall be five times the section area of the pump connection. Provide an adjustable support foot for diffusers installed on end suction pumps.

3.5 PIPE SLEEVES

A. Pipe sleeves shall be furnished and set by the Contractor, and the Contractor shall be responsible for their proper and permanent location. Piping will not be permitted to pass through footings, beams or ribs unless so noted on the drawings or with the consent of the Architect/Engineer. Pipe sleeves shall be installed and properly secured in place at all points where pipes pass through concrete or masonry construction and through all exterior walls, regardless of construction. Pipe sleeves, except sleeves in footings and beams shall be of sufficient diameter to provide approximately 1/4-inch clearance around the pipe, and in cases of insulated pipes, approximately 1/4-inch around the insulation. Pipe sleeves in footings and beams and exterior walls shall be of steel pipe. Sleeves in footings shall be not less than one inch or more than two inches larger in diameter than the pipe to be installed. Pipe sleeves in floors shall be cut flush with finished floor. Openings between piping and sleeves shall be made watertight with plastic cement to a minimum depth of two inches. Openings between piping and sleeves in all masonry or concrete interior walls and partitions shall be similarly caulked for acoustical reasons.

3.6 EXPANSION AND CONTRACTION

A. The Contractor shall make all necessary provisions for expansion and contraction of piping with offsets or loops and anchors to prevent undue strain.

3.7 PROTECTIVE COATINGS

A. All underground pipe except exterior cast iron water distribution pipe shall be wrapped with "Scotchwrap" No. 50 tape to give not less than two complete layers on the entire underground piping system, or piping shall have X-TRU Coat factory applied plastic protective covering.

B. All buried exterior cast iron water distribution piping shall be tar coated.

3.8 TESTING

A. Before any insulation is installed or before piping is covered or enclosed all piping systems shall be tested and proved tight at not less than 1 1/2 times the maximum service pressure which the piping systems will be required to handle, unless otherwise specified.

B. All tests shall be conducted in the presence of the Architect/Engineer and the building Owner or his representative. Any systems failing to meet the specified test requirements shall be corrected and retested until the test requirements are met.

3.9 FLUSHING, DRAINING AND CLEANING PIPE SYSTEMS

A. The Contractor shall flush water piping systems with water before placing them in operation. After systems are in operation and during the test period all strainer screens shall be removed and thoroughly cleaned. The Contractor shall notify the Architect/Engineer in writing when this requirement is to be accomplished.

B. All domestic water lines shall be sterilized as described in Section 221113 -DOMESTIC WATER SYSTEM of these specifications.

END OF SECTION

SECTION 22 1113

DOMESTIC WATER SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The Contractor shall furnish and install the Domestic Water System as shown on the drawings including specialties shown or called out in the fixture and/or equipment list and as necessary for satisfactory operation of the system.

1.3 RELATED WORK IN OTHER SECTIONS

220000 - PLUMBING INDEX
220500 - GENERAL PLUMBING REQUIREMENTS
220523 - VALVES
220700 - PIPING INSULATION
221000 – PIPE AND PIPE FITTINGS
230519 - PIPING SPECIALTIES

1.4 STERILIZATION

A. All domestic water piping shall be sterilized as described in Part 3 of this section.

PART 2 – PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Pipe and pipefittings shall be as described in Section 221000 - PIPE AND PIPE FITTINGS.

B. All piping in any utilities tunnel shall have welded or silver brazed joints.

2.2 SHOCK ABSORBERS

A. Shock absorbers and/or air cushions shall be installed where shown on the drawings. Shock absorbers shall be equal to Zurn Z-1700, Diatrol Series 500 or approved equal sized for the system being protected.

PART 3 – EXECUTION

3.1 INSTALLATION

A. The installation shall conform to the requirements of Section 220500 - GENERAL PLUMBING REQUIREMENTS, and Section 221000 - PIPE AND PIPE FITTINGS.

B. Insulating couplings shall be furnished and installed at all connections between copper and steel pipe to prevent electrolysis.

C. Each water service main, branch main, riser and branch to a group of fixtures shall be valved. Stop valves shall be provided at each fixture.

3.2 STERILIZATION

A. Domestic Water lines shall be sterilized as follows: Chlorine shall be applied to provide a solution of not less than 250 PPM. The chlorinating material shall be introduced into the waterline in a manner approved by the Architect/Engineer. The solution shall be circulated if provided with pumps and all valves in the line shall be operated several times during the contact period. After a contact period of no less than eight (8) hours the system shall be flushed with clean water until the residual chlorine content is not greater than 0.2 PPM.

B. The sterilization procedure shall be witnessed by the Architect/Engineer and Owner.

3.3 TESTS

A. General: All tests shall be conducted in the presence of the Architect/Engineer or his representative. Any systems failing to meet the specified test requirements shall be corrected and retested until the test requirements are met.

B. Water Systems: The complete water systems shall be hydrostatically tested at a pressure of 150 psi and shall show no loss in pressure for a period of one hour.

END OF SECTION

SECTION 22 1123

NATURAL GAS PIPING SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The Contractor shall furnish and install the Natural Gas System as shown on the drawings including specialties necessary for satisfactory operation of the system.

1.3 RELATED WORK IN OTHER SECTIONS

220000 - PLUMBING INDEX
220523 – VALVES
221000 – PIPE AND PIPE FITTINGS
230500 - GENERAL PLUMBING REQUIREMENTS

PART 2 – PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Pipe and pipe fittings shall be as described in Section 221000 - PIPE AND PIPE FITTINGS.

B. All underground gas piping shall be welded.

C. Any underground gas piping shall have a protective coating as specified in Section 221000 - PIPE AND PIPE FITTINGS.

D. All gas piping in any utilities tunnel shall be welded.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Furnish and install all piping as indicated on the drawings, and all accessories in strict accordance with the applicable gas code.

B. All gas piping in any utilities tunnel shall be isolated from any metal-to-metal contact with hangers, supports, rails, etc.

C. Ventilated conduit shall be used to carry natural gas piping whenever such piping is run under any building, building sidewalk, structure, or through or within a concealed return air space. Ventilated conduit construction shall conform to the details shown on the drawings.

D. Gas trains connecting gas fired equipment shall conform to UL requirements.

E. All equipment (AHU, AC, Water Heaters, etc.) connected to the gas system shall be connected with gas valve, union, dirt leg with removable cap (up 4” above any surface) and flexible connection.

F. All piping and accessories shall be supported by unistrut brackets and gasketed pipe clamps, inside of the building.

3.2 TESTS

A. All gas piping shall be tested with air pressure of 60 psi and shall show no loss in pressure for a period of 24 hours on a gauge for recording pressure.

END OF SECTION

SECTION 22 1313

SOIL AND WASTE PIPING SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The Contractor shall furnish and install the soil and waste piping system as shown on the drawings including specialties shown or called out in the equipment list and as necessary for satisfactory operation of the system.

1.3 RELATED WORK IN OTHER SECTIONS

220000 - PLUMBING INDEX
220500 - GENERAL PLUMBING REQUIREMENTS
221000 - PIPE AND PIPE FITTINGS

1.4 REQUIREMENTS

A. See Sections 220500 - GENERAL PLUMBING REQUIREMENTS and 221000 - PIPE AND PIPE FITTINGS for general requirements.

B. Furnish and install all concrete, grout and other required materials to fill all block outs and/or sleeves left open for this Subcontractor's convenience or for the installation of this work.

PART 2 – PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. The pipe and pipefittings shall be as described in Section 221000 - PIPE AND PIPE FITTINGS.

2.2 FLOOR DRAINS

A. Drains shall be Zurn, Wade or Smith and shall be equal to those specified on the drawings.

2.3 FLOOR SINKS

A. Drains shall be Zurn, Wade or Smith and shall be equal to those specified on the drawings.

2.4 CLEANOUTS

A. Cleanouts shall be as manufactured by Zurn, Wade or Smith and shall be of the same size as the pipe except that cleanout plugs larger than four inches will not be required. Cleanouts installed in connection with cast iron soil pipe shall consist of a long sweep, quarterbend or one or two eighth bends extended to an easily accessible place, or as indicated on the drawings.

B. Cleanouts in finish floors shall be of the type made to match the floor and/or covering. All exposed metal shall be polished or chrome plated brass.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation shall conform to Section 220500 - GENERAL PLUMBING REQUIREMENTS, and Section 221000 - PIPE AND PIPE FITTINGS.

B. Flashings: Vent pipes shall be flashed and made watertight at the roof with sheet lead flashing. Flashing shall weigh at least four pounds per square foot, shall be 24 inches square and shall be turned up around the pipe and into the top of the pipe. Vent pipes shall extend at least 12 inches above roof.

C. Traps: Each fixture and piece of equipment connecting to the drainage system shall be equipped with a trap. Each trap shall be placed as near to the fixture as possible and no fixture shall be double trapped.

D. Floor Drains: All floor drains shall be installed with grates square with the building lines.

3.2 TESTS

A. The entire sanitary system shall be tested in accordance with the requirements of the State Plumbing Code, all local codes and ordinances, and the Uniform Plumbing Code.

END OF SECTION

SECTION 22 4200

PLUMBING FIXTURES

PART 1 – GENERAL

1.1 SCOPE

A. Plumbing fixtures shall be supplied, set and connected as shown on plans. Fixtures shall be protected from damage during construction and shall be thoroughly cleaned of all tape, paint and adhesive prior to final acceptance.

PART 2 – PRODUCTS

2.1 PLUMBING FIXTURES

A. Plumbing fixtures shall be as manufactured by KOHLER, AMERICAN STANDARD or SLOAN and shall be as scheduled on the drawings.

B. Flush valves shall be as manufactured by Zurn, Delany or Sloan.

2.2 FITTINGS AND PIPES

A. Fittings and piping shall be brass and whenever exposed, shall be polished chrome-plated. Provide tight fitting wall and/or floor escutcheons of chrome-plated brass whenever pipes pass through floors, wall or ceilings.

B. All porcelain or vitreous china shall be clean, smooth and bright. All shall be warranted not to craze, discolor or scale.

C. This contractor shall furnish and install all required water, waste, soil and vent connections to all plumbing fixtures together with all fittings, supports, fastening devices, cocks, valves, traps, etc., leaving all in complete working order.

D. All automatic or self-closing valves for faucets shall be adjusted in accordance with manufacturer's instructions and supervised as necessary by equipment supplier's representative at the request of the Architect or Engineer.

E. Owner furnished equipment shall be connected with drains, traps, hot water, cold water and other services required for optimum operation. This contractor shall obtain information from the Owner or his approved representative for services required or field verify specific requirements.

END OF SECTION

SECTION 23 0000

HEATING, VENTILATING, AND AIR CONDITIONING INDEX

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish all service tools, equipment, etc., which are required for the complete installation of all Heating, Ventilating, And Air Conditioning Work, as indicated on the Drawings and specified herein. Heating, Ventilating, And Air Conditioning work indicated on the Drawings and/or specifications covering other trades shall conform to Division 23 of these Specifications.

B. Work or equipment not indicated or specified, which is necessary for the complete and proper operation of the Heating, Ventilating, And Air Conditioning systems, shall be accomplished without additional cost to the Owner.

C. Furnish all labor and materials required for Heating, Ventilating, and Air Conditioning service connections to all the various items of equipment requiring connection throughout the project shown on the Contract Drawings (even if not shown on Heating, Ventilating, and Air Conditioning Drawings). Coordinate with other trades for the installation of required connections and service.

1.3 HEATING, VENTILATING AND AIR CONDITIONING DIVISION INDEX

230100	DEMONSTRATION AND TRAINING
230500	GENERAL HEATING, VENTILATING, AND AIR CONDITIONING REQUIREMENTS
230513	COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230519	PIPING SPECIALTIES
230548	VIBRATION ISOLATION AND EXPANSION COMPENSATION
230593	BALANCING OF MECHANICAL SYSTEMS
230713	DUCT INSULATION
232113	HYDRONIC PIPING SYSTEMS
232500	WATER TREATMENT SYSTEMS
233000	AIR DISTRIBUTION

PART 2 – PRODUCTS

PART 3 – EXECUTION

END OF SECTION

SECTION 23 0100

DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. After completion of the installation and upon completion of the Test and Balancing, the Contractor shall schedule the System Demonstration, Operating Test, and Training Session for the Owner.

B. The following individuals, companies or representatives thereof shall be in attendance.
1. Mechanical Trade
2. Electrical Trade
3. Sheet Metal Trade
4. Controls Trade
5. Energy Management Systems Contractor
6. Test and Balance Agency
7. Air Handler Manufacturer
8. Fan Coil Manufacturer
9. Pump Manufacturer
10. Chiller Manufacturer
11. Boiler Manufacturer

1.3 RELATED WORK IN OTHER SECTIONS

230000 - HEATING, VENTILATING AND AIR CONDITIONING INDEX
230500 - GENERAL HEATING, VENTILATING, AND AIR CONDITIONING REQUIREMENTS
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230548 - BALANCING MECHANICAL SYSTEMS

1.4 QUALIFICATIONS

A. The representatives listed in 1.2B above shall be thoroughly familiar with the operation and function of the equipment or systems he represents and be prepared to indoctrinate the Owner or his designated personnel.

PART 2 – PRODUCTS

2.1 SCHEDULE

A. The Contractor shall schedule and coordinate the System Demonstration and Training Session for the Owner over 1 consecutive 8 hour working day.

B. The Owner may, after the training session has started:
   1. Excuse the equipment manufacturer when his indoctrination session is completed.
   2. Conclude the session early if he feels the intent and purpose of the session has been met.

2.2 ADJUSTMENTS

A. The Contractor shall have available, tools, equipment and personnel to readjust or refine the operation of any part of the mechanical system as directed by the Owner or Architect/Engineer.

PART 3 – EXECUTION

3.1 TRAINING

A. The Contractor shall schedule and coordinate the indoctrination of the Owner and his designated personnel during the Operating Test. The proposed time schedule shall be coordinated with the individuals, companies or representatives who will be conducting the indoctrination and training. This proposed time schedule shall be submitted to the Architect/Engineer for approval.

B. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and system at agreed upon times.

C. For equipment requiring seasonal operation, perform instructions for other seasons within six (6) months.
   1. Contractor shall provide a minimum of eight (8) hours of training for seasonal system operation.
   2. Contractor shall prepare a written report of training and submit to architect upon completion of training.

D. Use operation and maintenance manuals as a basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

E. Prepare and insert additional data in Operation and Maintenance manual when need for such data become apparent during instruction.

3.2 DOCUMENTATION

A. The Contractor shall prepare an indoctrination schedule similar to the following:
INDOCTRINATION SCHEDULE
PROJECT
LOCATION

PERSONNEL	ITEM/SYSTEM	DATE	START TIME	STOP TIME

B. The Owner shall initial each line to verify attendance.

3.3 OPERATING INSTRUCTIONS

A. The operating instructions specified in Sections 230500 and 253000 of these specifications shall be presented at the start of the Session. These instructions shall include manufacturer's published data having all information that does not apply crossed out.

3.4 OPERATING TEST

A. The Contractor shall conduct an operational test on all equipment installed under this Division of the Specifications. This test shall be continuous for a minimum of three consecutive days within seven days prior to the demonstration and training period with required data available at the demonstration and shall continue during the demonstration period. The test shall verify the operation of the mechanical systems and demonstrate the performance of the total system.

B. The following data shall be recorded hourly during normal building occupancy hours.
1. Outdoor ambient temperatures:
    a) Measure and record outdoor dry bulb and wet bulb temperature.
    b) Calculate and record relative humidity.
2. Indoor space temperature:
    a) Measure dry bulb temperature in several rooms served by each air handling unit including at least one room in each control zone. Note any variation over 2`F from setpoint.
    b) Measure wet bulb temperature in each space having a space humidistat. Calculate space relative humidity and note any variation over 5% from setpoint.
3. Water Temperatures:
    a) Entering and leaving each piece of equipment having a water temperature change including:
        1) Boilers
        2) Chiller coolers
        3) Air Handling Unit coils
        4) Fan Coil Unit coils
        5) Unit Ventilator coils
        6) Unit Heater coils
        7) Base Board Radiation
        8) Main branch loops
4. Air Temperatures:
    a) Entering and leaving each piece of equipment having air temperature change including:
        1) DX refrigeration coils
        2) Chilled water coils
        3) Heating water coils
        4) Air washers
        5) Air Handling Unit return, OSA and mixed air
        6) Fan coils
        7) Unit Ventilator including return, OSA and mixed air
        8) Unit Heater
5. Air Pressure:
    a) Building static pressure relative to ambient (outside)

b) Supply static pressure at outlet of each air handling unit
c) Supply static pressure at the end of each duct run
d) Supply static pressure at the inlet of each variable air volume terminal

6. Weather Conditions:
   a) Sun
   b) Wind velocity
   c) Precipitation
   d) Barometric pressure

3.5 READINGS AND MEASUREMENTS

A. The Test and Balance Agency shall be available and take any or all readings and measurements required or desired by the Owner or Architect/Engineer during this Demonstration and Training Session.

END OF SECTION

SECTION 23 0500

GENERAL HEATING, VENTILATING AND AIR CONDITIONING REQUIREMENTS

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes: General Mechanical Requirements specifically applicable to Division 23 sections in addition to Division 1- General Requirements.

B. Scope:

1. The work covered by this division consists of performing all operations in connection with the installation of heating, cooling, ventilating, and plumbing including site utility work as indicated under this section. This entire section applies to all mechanical work and all mechanical sections of these specifications. This Contractor shall read and comply with all sections of these specifications including all General and Special Conditions.

1.2 REFERENCES

A. Standard Requirements:

1. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. All work shall be executed in accordance with the local and state codes, ordinances, and regulations governing the particular class of work involved. This Contractor shall be responsible for the final execution of the work under this heading to suit these requirements. In the event of a conflict between the various codes and standards, the more stringent shall govern. Where these specifications and accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Architect/Engineer. The Architect/Engineer shall prepare any supplementary drawings required, illustrating how the work may be installed so as to comply. On approval of the change by the Architect/Engineer, the Contractor shall install the work in a satisfactory manner without additional cost to the Owner. On completion of the various parts of the work, the installation shall be tested by the constituted authorities and approved, and on completion of the work, this Contractor shall obtain and deliver to the Owner final certificates of acceptance. This Contractor shall furnish copies of each certificate to the Architect/Engineer.

C. The Contractor shall secure all permits and licenses for his work and shall pay all fees in connection with such permits and licenses.

D. The contractor shall hold and save the Owner free and harmless from liability of any nature or kind arising from his failure to comply with codes and ordinances.

E. Any and all meter deposits and all utility extension costs shall be paid by the Contractor whose work is done in connection with the service that the meter is connected to.

F. Schedule of Referenced Organizations: The following is a list of the acronyms of organizations referenced in these Specifications:

1. AABC Associated Air Balance Council
2. ADC Air Diffusion Council
   435 North Michigan Ave.
   Chicago, IL 60611
3. AGA American Gas Association
   1515 Wilson Boulevard
   Arlington, VA 22209
4. AMCA Air Movement and Control Association
   30 West University Drive
   Arlington Heights, IL 60004
5. ANSI American National Standards Institute
   1430 Broadway
   New York, NY 10018
6. ASHRAE American Society of Heating Refrigerating and Air Conditioning Engineers
   345 East 47th Street
   New York, NY 10017
7. ASME American Society of Mechanical Engineers
   345 East 45th Street
   New York, NY 10017
8. ASTM American Society for Testing and Materials
   1916 Race Street
   Philadelphia, PA 19103
9. AWWA American Water Works Association
   6666 West Quincy Avenue
   Denver, CO 80235
10. AWS American Welding Society
    2501 NW 7th Street
    Miami, FL 33125
11. FM Factory Mutual System
    1151 Boston-Providence Turnpike
    Norwood, MA 02062
12. FS Federal Specification
    General Services Administration
    Specifications and Consumer Information Distribution Section (WFSIS)
    Washington Navy Yard, Building 197
    Washington, DC 20407
13. NBFU National Board of Fire Underwriters
    5530 Wisconsin Avenue, Suite 750
    Chevy Chase, Maryland 20815
14. NEC National Electric Code (of NFPA)
15. NEBB National Environmental Balancing Bureau
    8224 Old Courthouse Road
    Vienna, VA 22180
16. NEMA National Electrical Manufacturer's Association
    2101 L Street, NW
    Washington, DC 20037
17. NFPA National Fire Protection Association

		Battery March Park Quincy, MA 02269
18.	NSF	National Sanitation Foundation Box 1468 Ann Arbor, MI 48106
19.	OSHA	Occupational Safety and Health Administration U.S. Department of Labor
20.	SMACNA	Sheet Metal and Air Conditioning Contractor's National Association 8224 Old Courthouse Road Vienna, VA 22180
21.	TIMA	Thermal Insulation Manufacturers Association Technical Services 1420 King Street Alexandria, VA 22314
22.	UL	Underwriters Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062

G. Underwriters Laboratories Inc. (UL): All materials, appliances, equipment, devices or appurtenances shall conform to the applicable standards of Underwriters Laboratories Inc., where such standards have been established.

1.3 DRAWINGS

A. Drawings and specifications shall be considered as cooperative, and work or materials called for by one and not mentioned in the other, or vice versa, shall be done and furnished as though treated by both.

B. In the cases of discrepancies in figures, drawings, or specifications, the Architect/Engineer shall be notified immediately and his decision shall determine the necessary adjustment. Without such decision, said discrepancies shall not be adjusted by the Contractor save only at his expense, and, in case of any settlement or any complication arising from such adjustment to the Contractor, he shall bear all extra expense involved.

C. Should it appear that the work intended to be done, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings or specifications, the Contractor shall apply to the Architect/Engineer for such further drawings or explanations as may be necessary, allowing a reasonable time for the Architect/Engineer to supply same, and the Contractor shall conform to same as part of the Contract.

D. Should any doubt or question arise in respect to the true meaning of the drawings or specifications, reference shall be made to the Architect\Engineer whose decision shall be final and conclusive. No alleged oral admission, condonation, or inadvertent neglect on the part of the Architect/Engineer will be accepted as an excuse for inferior work.

E. The mechanical plans do not give exact details as to elevations of ductwork and piping, exact locations, etc., and do not show all offsets, control lines, pilot lines, and other installation details. The Contractor shall carefully lay out his work at the site to conform to the structural conditions, provide proper grading of lines, to avoid all obstructions, to

conform to details of installation supplied by the manufacturer of the equipment to be installed, and thereby to provide an integrated, satisfactory operational installation.

F. Should the particular equipment which any Bidder proposes to install, require other space conditions than those indicated on the drawings, the Bidder shall arrange for such space with the Architect/Engineer before submitting his bid. Should changes become necessary on account of failure to comply with these details, the Contractor shall make such necessary changes at his (the Contractor's own expense).

G. The Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans which shall be checked by the Architect/Engineer and approved before the work is started, Contractor before work proceeds. Interference with structural conditions shall be corrected by the Contractor.

H. All equipment shall be installed in accordance with the manufacturer's recommendations. Provide all accessories and components for optimum operation as recommended by the manufacturer.

I. Site visit: The Contractor shall visit the site prior to bidding and satisfy himself as the conditions under which the mechanical systems are to be installed. No subsequent allowance shall be made in his behalf for failure to make such a visit. Contractor shall examine all work noted under the demolition drawings and all new work and shall satisfy himself as to the extent of work required to be completed.

1.4 SYSTEM DESCRIPTIONS

A. Not Used.

1.5 PRIOR APPROVALS

A. Each equipment item for which the Contractor desires to install equipment other than the specific item identified in the equipment schedule or equivalent equipment by manufacturers specifically named in the schedule, the Contractor shall bear full responsibility to prove to the Engineer that the furnished equipment is equivalent to or better than the specified item. Failure to provide such proof will result in rejection of the shop drawing submittal by the Engineer. Prior written or verbal approval by the Engineer of equipment by other manufacturers will not relieve the Contractor of responsibility to provide equivalence. Prior approval is required, however, any prior approval given is intended only to provide preliminary agreement that the alternate manufacturer may make equipment that complies with the specification requirements and not that all equipment manufactured by him is acceptable.

1.6 SHOP DRAWINGS

A. Shop drawings or fully descriptive catalog data shall be submitted by the Contractor for all items of material and equipment furnished and installed under this Contract. This shall include piping, ductwork, mechanical equipment, plumbing equipment, control items, etc. The Contractor shall submit to the Architect/Engineer a sufficient number of copies of all such shop drawings or catalog data to provide him with as many review copies as he may need, plus three (3) copies for retention by the Architect/Engineer. No

materials or equipment shall be installed until officially approved by the Architect/Engineer.

B. Before submitting Shop Drawings to the Architect/Engineer for review, the Contractor shall examine them and satisfy himself that they are correctly representative of the material or equipment to which they pertain. The Contractor shall so note these Drawings before submitting them. The Contractor's review of Shop Drawings is not intended to take the place in any way of the official review of the Architect/Engineer, and the Shop Drawings which have not been reviewed by the Architect/Engineer shall not be used in fabrication or installing any work.

C. The review of Shop Drawings or catalog data by the Architect/Engineer shall not relieve the Contractor from responsibility for deviations from the plans and Specifications unless he has, in writing, specifically called attention to such deviations as the time of submission and has obtained the permission of the Architect/Engineer thereon, nor shall it relieve him from the responsibility for error of any kind in Shop Drawings. When the Contractor does call such deviations to the attention of the Architect/Engineer, he shall state in his letter whether or not such deviations involve any extra cost. If this is not mentioned, it will be assumed that no extra costs are involved for making the change.

D. After receiving approval on the make and type of materials, the Contractor shall order such materials in sufficient time so that no delay or changes will be caused. This is done to facilitate progress on the job and failure on the part of the Contractor shall render him liable to stand the expense of any and all delays occasioned by failure on this part to provide necessary details. All shop drawings shall be delivered to the Architect/Engineer's office within thirty (30) days from the date of the contract.

E. Shop drawings will be returned unchecked unless the following information is included: reference to all pertinent data in the Specifications or on the drawings, size and characteristics of the equipment, name of the project and a space large enough to accept an approval stamp. The data submitted shall reflect the actual equipment performance under the specified conditions and shall not be a copy of the scheduled data on the drawings.

1.7 SUBMITTALS

A. Submittal data shall be organized in commercial quality, three ring binders with durable and cleanable covers. Product information for each piece of equipment shall be separated by an indexing leaf with clear tabs. The product name and symbol (i.e. AHU/Air Handling Unit) shall be typed on white paper inserts and placed in appropriate tab. Complete data must be furnished showing performance, quality and dimensions. A signed review by the Architect/Engineer must be obtained before purchasing any equipment.

B. The following items shall be submitted for review by the Architect/Engineer but are not limited to:
1. Air Conditioning Units
2. Fans
3. Diffusers, Registers and Grilles
4. Fire Dampers
5. Pipe Insulation

6. Duct Insulation
7. Coils
8. Air Washer Assembly
9. Temperature Controls
10. Cross Connection Control Devices
11. Plenum Materials and Supports
12. Pumps
13. Hydronic Air Control Devices
14. Kitchen Hood and Fans
15. Filter Assemblies and Filters
16. Fan Coil Units
17. Heat Exchangers
18. Flexible Pipe Connections
19. Heating Terminal Equipment
20. Roof Top Equipment
21. Ductwork Shop Drawings
22. Radiant Heating Equipment
23. Vibration Isolation Equipment and Calculations

1.8 QUALITY ASSURANCE

A. General: Comply with Division 1.

B. Welder Qualifications: Welders shall be certified by the American Society of Mechanical Engineers (ASME) National Certified Pipe for the type of work being performed. Current operators' certificates in accordance with ASME standards shall be on file at the site and shall be available to the Architect/Engineer for examination. Coupons shall be available for review by the Architect and Engineer.

C. Locations of all pipes, ducts, outlets, appliance, etc., as shown on the drawings, are approximate only and are understood to be subject to such revisions as may prove necessary or desirable at the time the work is installed. Each Contractor will be required to install his work with relation to existing building conditions and shall be entirely responsible for the correctness of his work with reference to finished elevations, etc. Piping shown on the drawings is diagrammatic only and their exact locations, depths, and invert elevations shall be as required for proper flow and coordination with other trades.

D. The contract drawing depicts graphically the arrangement of piping and ductwork. Should local conditions necessitate a rearrangement, or if any of the piping or ductwork can be installed to better advantage in a different manner, the Contractor shall, before proceeding with the work, prepare and submit three (3) copies of Drawings of the proposed arrangement for the Architect/Engineer's review.

E. If the Contractor proposes to install equipment, including piping and ductwork, requiring space conditions other than those shown, or to rearrange the equipment, he shall assume full responsibility for the rearrangement of the space and shall have the Architect/Engineer review the change before proceeding with the work. The request for such change shall be accompanied by Shop Drawings of the space in question.

F. Each Contractor is responsible for the proper location and size of all slots, holes, or openings in the building structure pertaining to his work, and for the correct location of pipe sleeves.

G. Each Contractor shall coordinate his work with that of all other trades that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipelines which require a stated grade for proper operation. Drainage lines shall take precedence over water lines in determination of elevations. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical conduit and ductwork.

H. All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Lubricate all equipment properly in accordance with manufacturer's instructions. Furnish zerk grease fittings on all greaseable bearings.

I. Equipment and Materials: The materials and equipment shall be new and shall be the standard products of the manufacturers regularly engaged in the production of Plumbing, Heating, Cooling, Ventilation, and Fire Protection Equipment, and shall be the manufacturer's latest standard design. Where two or more units of the same class of equipment are required, these units shall be the products of the same manufacturer. However, the component parts of the systems need not be the products of the same manufacturer. Specific equipment specified hereinafter is to be considered a standard of quality and operation. In general, all capacities of equipment, and motor and starter characteristics are shown in schedules on the drawings. Reference shall be made to the schedules for specific information. The capacities shown are minimum capacities. Variations in the characteristics will be permitted only on written approval of the Architect/Engineer. All equipment shall be shipped to the job with not less than a prime coat of paint or as specified hereinafter. Insofar as is possible all items of the same type (i.e., pumps, fans, etc.) shall be by the same manufacturer. Where installation instructions are not included in these specifications or on the plans, the manufacturer's instructions shall be followed. All equipment affected by altitude shall be rated to operate at the altitude where it is to be installed.

J. Excavation and Backfilling: This Contractor shall do all necessary excavation and backfill for the installation of the Mechanical systems as may be required. Curb cuts, asphalt and concrete patching, cutting and patching existing floor, etc., shall be part of this Contractor's responsibility. No extra payment will be made for rock excavation. Trenches for all underground piping shall be excavated to the required depths. The bottoms of trenches shall be tamped hard and graded to secure maximum fall. Bell holes shall be excavated to assure the pipe resting for its entire length on solid ground. Should rock be encountered, it shall be excavated to a depth of 6 inches below the bottom of the pipe, and before laying the pipe, the space between the bottom of the pipe and the rock surface shall be filled with gravel, thoroughly tamped. Pipe laid in trenches dug in fill shall be supported down in the trenches and shall be filled. No roots, rocks or foreign materials of any description shall be used in backfilling the trenches. The backfill material shall be identical to the surrounding fill material and shall be placed in 6-inch layer, wetted, and compacted to the density of the adjacent soil. See Division 2 for additional information for site utilities. All surplus materials shall be hauled from the project by the Contractor at his expense.

K. Cutting and Repairing:
1. Responsibility of the Contractor whose work is involved. Coordinate with others to prevent unnecessary cutting and repairing.
2. Lay out and locate equipment, openings, and chases. Install sleeves, inserts, and supports. Arrange with those whose work is involved to do cutting and replacing caused by negligence or error with costs reimbursed by the Contractor at fault. Cutting and replacing of existing work shall be the responsibility of the Contractor whose work is being installed.
3. Removal or terminating connections of existing work which is abandoned or replaced shall also be done hereunder to provide correct and finished work.

L. Foundations: All equipment shall be provided with suitable foundations and supports. It shall be the responsibility of the Contractor to provide for the proper locations of these foundations and supports. This applies to all rooftop equipment also.
1. All concrete foundations required by equipment furnished by the Mechanical Contractor shall be constructed by them (except where otherwise noted) the conformity with the recommendations of the manufacturer of the respective equipment, and with the approval of the Architect/Engineer. All corners of the foundations shall be neatly chamfered. Foundation bolts shall be placed in the forms when the concrete is poured. Allow 1 inch below the equipment base for alignment, leveling and grouting with nonshrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary. After removal of the forms, the surface of the foundation shall be rubbed.
2. Unless otherwise noted, foundations shall be a minimum of 6-inch high. All concrete work performed by these Contractors shall conform entirely to the requirements of the Concrete Specifications which describe this class of work.

M. Code Requirements: Comply with state and local code requirements and ordinances. Call for inspections required by responsible building inspection authority.

N. Applicable Building Codes and Ordinances: Including the latest edition of each code, but not limited to the following:
1. International Building Code.
2. Uniform Mechanical Code.
3. Uniform Plumbing Code.
4. Governing Fire Department Requirements
5. Utility Company Requirements
6. National Fire Protection Association Standards
7. NFPA 70 - National Electrical Code
8. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
9. NEPA 90B - Installation of Warm Air Heating and Air Conditioning Systems
10. NFPA 13 - Sprinkler Systems
11. NFPA 101 - Life Safety
12. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment
13. International Energy Conservation Code 2018

O. Access Panels

1. Similar to Milcor, or as noted on the drawings, size as required for concealed expansion joints, valving, gauges, balancing dampers, valves, traps, pitot stations, equipment and similar items requiring accessibility. Notify the General Contractor of each access panel location and the required size. Panels shall be proper type for ceiling or wall in which they are installed. The panels shall be furnished under this section of the Specifications, unless otherwise directed, but shall be coordinated to be compatible with walls and ceilings furnished under other sections.

1.9 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1

B. Large Items: Make arrangements with other trades on the job for introduction into the building of equipment too large to pass through finished openings.

C. Acceptance: Check and sign for materials to be furnished by others for installation under all Mechanical Divisions upon delivery. Contractor shall be responsible for the storage and safekeeping of such materials from time of delivery until final acceptance.

D. Protection: Close ends of pipe and ductwork at the close of each working day during construction to prevent entry of foreign material. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Protect fixtures and equipment against damage during mechanical work with heavy paper or plastic until final clean-up.

E. Storage: Store equipment in covered enclosure or wrap with weather tight 6 mil Visqeen.

F. Shipping Protection: Protective casings, crating, and coverings to remain in place until start-up of equipment.

1.10 PROJECT CONDITIONS

A. Performance: All systems are to be rated at [5,500 ft.] elevation.

1.11 SEQUENCING AND SCHEDULING

A. General: Comply with Division 1.

B. Schedule: Coordinate and order the progress of mechanical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.

C. Utility Interruptions: Schedule mechanical utility interruptions with the Architect/Engineer/Owner minimum of seven (7) days prior to the requested outage. Plan work so that duration of the interruptions a maximum of one day.

1.12 CONTROLS WIRING AND ELECTRICAL EQUIPMENT

A. All mechanical equipment controls wiring, conduit, relays, interlocks, and all accessories required for a completely operational controls system shall be the complete responsibility of the mechanical contractor. The mechanical contractor has the option to hire the project electrical contractor or any qualified controls contractor to install mechanical controls wiring and conduit. Refer to specification 251000 for installation requirements. Refer to Specification Section 253000 for coordination requirements between mechanical, electrical, and controls subcontractors.

B. Electrical items such as disconnect switches and motor starters associated with equipment provided by Division 23, when specifically mentioned to be furnished by the Mechanical Contractor, whether in these specifications or on the Electrical or Mechanical Drawings, shall be furnished by the Contractor. These items shall be mounted and connected as required for a completely operational system. See Control Systems Specification for further information.

C. All electrical equipment characteristics (voltage, etc.) must be verified by the Contractor prior to ordering. If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Architect/Engineer of the change and shall then coordinate the change with the Electrical Contractor and shall pay all additional charges in connection with the change.

D. All motors shall meet all the requirements of all Electrical Divisions.

1. All motors shall be built in accordance with the current applicable IEEE, ASA, and NEMA standards. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. All motors shall have copper windings. All motors to have minimum power factor of 85% or have switched correction to 90%. Unless indicated otherwise, motors shall be NEMA design B with a service factor of 1.15 with 40°C rise and total temperature rise of 65°C ambient and when powered from the system voltage feeding the motor. TEFC motors shall a service factor of 1.00 with total temperature is of 65°C in the above conditions. Motors located in areas exceeding 40°C ambient shall be factory-rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Type N split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 HP or less may be shaded pole induction motors.

1.13 PROTECTION AGAINST HAZARDOUS CONDITIONS

A. The Contractor shall take precautions against hazardous construction conditions at all times during construction. The final condition of the facilities shall be safe, and where safety to operating personnel is jeopardized, suitable signage shall be posted.

B. Protruding metal (bolts, steel angles, etc.) potentially hazardous to maintenance and operating personnel, shall be cut back and/or protected to reduce the risk of injury. All openings between floors shall be protected with barriers around the openings, gratings

across the openings, or steel bars through the openings to avoid and protect against injury.

1.14 HAZARDOUS SIGNS

A. Equipment room contains moving or rotating parts, floor openings, or other potentially hazardous environments and shall include a sign on the door entering it that shall read similar to the following: **Hazardous Area - Authorized Personnel Only.**

1.15 OPERATING AND MAINTENANCE INSTRUCTIONS

A. The Mechanical Contractor shall furnish to the Owner a bound (three (3) ring binder) manual in triplicate, containing complete repair parts lists, and operating, service, and maintenance instructions on all mechanical equipment, fixtures, and systems, as noted below:

1. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer, Sub-consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
2. For Each Product System: List names, addresses and telephone numbers of Sub-contractors and suppliers, including local source of supplies and replacement parts.
3. Product Data: Mark each sheet to clearly identify specific product and component parts, and data applicable to installation. Delete inapplicable information.
4. Warranties and Bonds: Bind in copy of each.
5. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
6. Include color-coded wiring diagrams as installed for control system.
7. Operating Procedures: Include start-up, break-in and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.
8. Maintenance Requirements: Include routine procedures and guide for trouble-shooting, disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
9. Provide servicing and lubrication schedule and list of lubricants required.
10. Include manufacturer’s printed operation and maintenance instructions.
11. Include sequence of operation by controls manufacturer.
12. Provide original manufacturer’s part list, illustrations, assembly drawings and diagrams required for maintenance.
13. Provide control diagrams by controls manufacturer as installed.
14. Provide charts of valve tag numbers, with locations and functions of each valve, keyed to flow and control diagrams.
15. Provide list of original manufacturer’s spare parts and recommended quantities and to be maintained in storage.
16. Include Test and Balance (T&B) Reports as specified in Section 230593.

B. The Mechanical Contractor shall also provide training as required by Section 230100 to the Owner's operation and maintenance personnel.

1.16 OPERATION PRIOR TO ACCEPTANCE

A. The Owner shall have the right to operate any and all apparatus as soon as and as long as it is in operating condition, after Owner personnel have received operational training, whether or not such apparatus has been accepted as complete and satisfactory, except that this shall not be construed to mean operations before any required alterations or repairs have been made. This operation does not indicate acceptance of the equipment by the Owner. When the Contractor enters into a contract with the Owner, he agrees to the above.

1.17 WARRANTY AND SERVICE PROGRAM

A. Due to the critical performance requirements and to clearly establish warranty responsibility for this project, the Contractor shall provide a full service maintenance and warranty program to the Owner for one full year after beneficial occupancy (substantial completion).

B. This service program shall be included as part of the base bid and shall include service, maintenance, repair, replacement, lubrication, temperature control calibration and repairs, and documenting proof for all service and maintenance work on all equipment and system furnished by the Contractor.

C. A single representative in the employment of the Contractor shall be responsible for coordination and follow through of this program. This representative's name and phone number shall be submitted to the Owner as part of the maintenance manuals and supportive data. The Contractor shall respond to a request for service with 24 hours if so requested.

D. During this first year of operation, the following sequence of maintenance service shall be performed as a minimum.
   1. Clean strainers in piping.
   2. Fans and/or pumps be lubricated and oiled once every four (4) months.
   3. Controls shall be calibrated throughout the facility at the end of six (6) months (following substantial completion). Any leaks in the piping systems shall be repaired.
   4. All equipment manufacturer's service recommendations shall be followed during this period.

1.18 FLUSHING AND DRAINING

A. It shall be the responsibility of this Contractor to properly drain and flush all ducts and pipes before use or acceptance to ensure that all debris is completely removed. Damage caused by such debris remaining in the ducts or pipes shall be repaired by this Contractor at his expense. This Contractor shall demonstrate to the Architect/Engineer's representative that all piping is clean.

1.19 CLEANING

A. This Contractor shall remove from the building construction site all rubbish and dirt as it accumulates under the contract. At completion, all areas shall be broom cleaned and all obstructions, surplus materials, etc., removed.

1.20 GUARANTEE

A. The Contractor shall guarantee all materials, equipment, and workmanship furnished and installed by him under this Contract, to be free from all defects of workmanship and materials, and shall agree to replace at his expense, without expense to the Owner, at any time within one year after installation is accepted by the Architect/Engineer, any and all defective equipment, parts, etc., that may be found. (This excludes normal maintenance and daily servicing of equipment which is the Owner's responsibility.)

1.21 FLOOR, WALL, AND CEILING PLATES

A. Where exposed pipes pass through floors, finished walls, or finished ceiling, they shall be fitted with chromium-plated escutcheons of an approved pattern. Escutcheons and plates in Mechanical Rooms do not require chrome finish.

B. This Contractor shall be responsible for providing and installing all counter flashing. All openings in the roof shall be flashed and counterflashed. Use four pound lead flashing materials for all vent lines and welded flashing in steel lines passing through roof. The Mechanical Contractor shall notify the General Contractor where each roof penetrations are and the size of the opening.

1.22 PIPE SLEEVES

A. Schedule 40 steel pipe sleeves or pipe sleeves made of No. 20 gauge galvanized steel, properly secured in place with approximately 1/4" space between each sleeve and the surface of the pipe and/or insulation passing through it, shall be provided for all pipes passing through concrete floors, roofs, and masonry walls. All pipe sleeves shall be fixed in place as the walls and floors are built up. The Contractor shall furnish and locate all sleeves and pipes passing through concrete floors, exterior masonry walls, and roofs shall be made watertight with approved non-hardening plastic material. Sleeves through pipe chase or equipment room floors shall project a minimum of 2-inch above the floor and shall be of black steel pipe with waterproof flange at center of floor thickness. Each sleeve through a fireproof wall shall be packed with approved fireproof rope in the annular space.

1.23 PIPE HANGERS

A. Pipe hangers shall be Fee and Mason of a type suitable for each use. Perforated straps shall not be used in any work. For ferrous pipes up to and including 4 inch in size, use Fee and Mason Fig. 199 malleable iron, adjustable, split ring, swivel hanger. For plumbing piping larger than 4 inch, use Fee and Mason Fig 239 steel clevis hanger. Where several pipes are parallel at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where indicated on the Drawings. For copper pipes up to and including 3 inch in size, use Fee and Mason

Fig. 360 malleable iron, copper plated hangers. For copper pipes larger than 3 inch, use Fee and Mason Fig. 364 copper plated clevis hanger.

B. Hanger rod sizes shall conform to the following schedule:

1.	Pipe up to and including 2"	3/8" rods
2.	Pipe 2-1/2", 3" and 3-1/2"	1/2" rods
3.	Pipe 4" and 5"	5/8" rods

C. Unless shown otherwise on the Plans, all horizontal runs of ferrous piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following spacing:

1.	Pipe up to and including 1-1/4"	8'
2.	Pipe 1-1/2" and 2"	10'
3.	Pipe 2-1/2" and 3"	12'
4.	Pipe 3 1/2” and 4”	14’

D. Unless shown otherwise on the Plans, all horizontal runs of copper piping shall be suspended from the floor or roof construction as the case may be, by means of hangers with the following maximum spacing:

1.	Pipe up to 3/4" in size	5'
2.	Pipe 1" and 1-1/4"	6'
3.	Pipe 1-1/2" and larger	10'

E. There shall be a hanger within 2 inch of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Cast iron pipe shall have not less than one hanger per length of pipe. Vertical risers shall be supported by approved riser clamps at each floor. Vertical pipes within a space shall have not less than two supports.

F. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting, nor shall it be supported from equipment connection.

G. Hanger rods for all equipment, pipes, ducts, trapezes, vibration isolators, etc., shall be installed straight, true and plumb. Do not bend or flex hanger rods to accommodate sloping structures, avoid obstacles, or for any other purpose. Where necessary, utilize swivel beam clamps, beveled or swivel hardware, angled, swivel or hinged brackets spanning members or other appropriate means of connection.

H. Expansion bolts shall be Ackerman-Johnson or Hilti.

I. Beam clamps suitable for use with this type of steel construction involved shall be Grinnell.

1.24 PRESSURE VESSEL CERTIFICATION

A. Not used.

1.25 ISOLATION

A. Excessive vibration or objectionable noise created in any part of the building by the operation of any equipment furnished and/or installed under the Mechanical Contract will be extremely objectionable and the Contractor shall take all precautions against the same by isolating the various items of equipment from the building structure and by such other means as may be necessary to eliminate all excessive vibration and objectionable noise produced by any equipment installed by them, and consequently, they shall design all foundations, supports, etc., for their equipment, and all piping with this end in view. In addition, these Contractors shall supervise the construction of all foundations and supports, whether they build them or not, in order that they may be constructed in such a manner as to prevent the transmission of objectionable noise and/or excessive vibration. Submit calculations on all vibration isolation equipment.

B. All equipment having moving parts shall be isolated from the building structure by means of Korfund isolation materials, unless specifically noted otherwise. All isolators shall be the same brand and shall be supplied from the same source. Equipment manufacturer's recommendations shall be followed in the isolation of equipment.

C. Vibration isolators shall have sufficient resilience to meet the following minimum efficiencies:

Motor HP	Equipment Room
Up to 5	90%
7-1/2 to 15	93%
20 to 40	95%
50 to 100	97.5%

D. Spring isolators shall be of the housed type with ribbed pads bonded to the underside of the baseplate or may be unhoused stable springs. Isolators shall be furnished with snubbers and limit stops where so recommended by the equipment manufacturer.

E. The Supplier of the isolating equipment shall, upon completion of the job, check all isolating materials and verify that they are installed properly, and submit a report in writing to the Architect/Engineer.

1.26 TESTING

A. Before completion of this project, the Mechanical Contractor shall test all materials and equipment which normally require testing. All piping, etc., shall be tested to meet code requirements or the Specification requirements, whichever is more stringent.

B. All equipment shall be operated sufficiently long enough to prove to the Architect/Engineer that the equipment performs satisfactorily and meets the requirements set forth on the Plans or in these Specifications.

1.27 CERTIFICATIONS

A. Before receiving final payment, the contractor shall verify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications. Submit certifications and acceptable certificates to the Architect/Engineer.

1.28 GENERAL PIPING INSTALLATION REQUIREMENTS

A. Provisions for Drainage: All piping systems shall be installed so that they may be easily drained. Drain caps, plugs, or hose bibbs shall be installed at low points. Grade piping toward drain locations.

B. Alignment: All installed pipelines shall be straight and shall remain straight against strains. Proper allowance shall be made for expansion and contraction.

C. Clean as Installed: All piping shall be kept free from scale or loose dirt when installed and must be kept clean during the completion of the installation. All openings in the piping system shall be capped or plugged while awaiting further connections. All detergents, solvents and other cleaning agents shall be compatible with the materials of fabrication of the system in which they are used. They shall not adversely affect the materials of mechanisms in the systems and they shall be acceptable to equipment manufacturers. All detergents, solvents, and other cleaning agents shall also be compatible with the process streams to be handled by the systems in which they are used.

D. Insulated Fittings: Install between any dissimilar metals such as steel and copper.

E. Expansion and Contraction: The Contractor shall make all necessary provisions for expansion and contraction with proper fittings, anchors, dresser couplings, loops, etc. Install flexible connectors on each pipe at each building expansion joint.

F. Welding: Refer to Paragraph 1.29 of this section of these specifications.

G. Bending: No bending of pipe will be permitted.

H. General: The installation shall be coordinated with respect to space available with heating, cooling, ventilating, and electrical installation. In every instance where there is a conflict in the routing of the piping and the ducting, the routing of the ducting shall govern. Installed piping shall not interfere with the operation or accessibility of doors or windows, shall not encroach on aisles, passageways, and equipment, and shall not interfere with the servicing or maintenance of equipment. Pipe shall be cut accurately to measurements established at the construction site and shall be worked into place without springing or forcing, properly clearing all openings and equipment. Cutting or weakening of structural members to facilitate piping, installation is not permitted. Pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Piping above ground shall be run parallel with the lines of the building unless otherwise noted on the drawings. Unless otherwise shown on the drawings, horizontal piping shall pitch down in the direction of flow with grade of not less than 1 inch in 40 feet. Piping connections to equipment shall be in accordance with details shown on the drawings or as recommended by the equipment manufacturer. Service pipe valves and fittings shall be kept a sufficient distance from other work to permit finished covering not less than 1/2 inch from such other work, and not less than 1/2 inch between finished covering on the different services.

I. Installation of Valves: Valves shall be installed at the locations shown on the drawings and where specified and where directed at site. Gate valves shall be used unless otherwise shown, specified, or directed. All valves shall be installed with their stems

horizontal or above. Where tight shutoff is required, a composition seat globe valve or resilient seat ball valve shall be used.

J. All valves which must be used during operation, all control valve assemblies, instrument control cases, liquid level controls, gage glasses, orifices, relief valves, and other equipment which must be observed, adjusted, or serviced during operation shall be located conveniently accessible from an operating platform or grade.

K. In general, relief valves within processing unit limits shall be located conveniently accessible from an operating platform or grade.
1. Those in non-hazardous service, such as water, shall discharge directly to outside.
2. Relief valves should have no piping between the vessel or line and the valve inlet, except as shown on the drawings.
3. Relief valves shall be installed in a vertical position. Vent piping shall be braced and supported in a manner that will not produce excessive stresses in the relief valve and will permit removal of the relief valve without necessary temporary supports for the vent lines.

L. Equipment Connections: All piping connections to pumps and other equipment shall be installed without strain at the pipe connection of the equipment. The contractor shall be required as directed to remove the bolts in flanged connections or disconnect piping to demonstrate that the piping has been so connected. Pipe connections to equipment shall be made with unions or flanged fittings. Provide removable headers for large equipment for service access.

M. Joints
1. Flanged Joints: All flanged joints shall be face matched. Raised face flanges shall not be mated to flat-faced cast-iron flanges on valves or equipment. The raised face must be turned off. All flanged bolt holes shall straddle the horizontal and vertical center line unless otherwise noted.
2. Screwed Joints: Screwed pipe joints shall have American Standard Taper Pipe Threads ANSI-B2.1 Latest Edition. Burrs formed when cutting pipe shall be removed by reaming. Care shall be taken that the inside of pipe is thoroughly clean and free of cutting oil and foreign matter before installation. Joints shall be made perfectly tight by the use of Teflon tape or approved Teflon thread sealing and lubricating compound.
3. Solder-Joints: Tubing shall be cut square and burrs removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool or wire brush before seating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Joints for serrated fittings on water, compressed air below 60 psig, and vacuum lines shall be made with a 95 percent tin and 5 percent antimony. Cored solder or solder containing lead will not be permitted.

N. Reducers: Reduction in pipe size shall be made with one piece reducing fittings. Bushings reducing at least two pipe sizes will be acceptable only when there is no room for reducing couplings or swaged nipples.

O. Unions: All piping unions shall be of the ground joint type constructed from materials equivalent in alloy composition and strength to other fittings specified with which they

are used. Union Pressure classes and end connections shall be the same as the fittings used in the lines with the unions. Steel unions shall have hardened stainless steel seating surfaces on both faces.

P. Hanger Supports:

1. All hanger rods used to support piping, conduit, mechanical units, equipment, trapezes and other items shall be straight and installed plumb, regardless of length. Do not bend rods to adapt to sloped or rotated structural members, secondary support members or to sloped mounting holes on supported equipment. Contractor shall utilize available swivel, hinged, or rigid mounting techniques designed to accommodate a slope or rotation, or shall design a custom solution. Selected techniques for each application shall be submitted for approval prior to use.
2. Do not bend rods to circumvent an obstruction.
3. Loads on hanger rods shall be applied in direct tension. Do not apply compression, lateral or moment loads to hanger rods. Install bracing or additional supports to prevent hanger rod from incurring non-tension loading.
4. Do not create offsets in rods; use only in-line couplers, and only when length of coupled rod exceeds standard available length (typically 12 feet), or when full lengths cannot be placed in position. Provide additional horizontal bracing to prevent swaying of supported piping or equipment.
5. Do not straighten bent rods for subsequent use. If a rod becomes bent, cut off and discard the bent portion. Remaining straight portion of rod may be used.

1.29 WELDING

A. All welding of piping covered by this specification, regardless of condition of service shall be accompanied as follows:

1. The welding shall be in accordance with the recommendations of the American Welding Society. Mitering of pipe to form elbows, notching to form these, or any similar construction will not be permitted. Welding fittings shall be installed on all welded lines. Joints to be welded shall be properly aligned and spaced, using special welding clamps where necessary. All welders to be employed shall have passed qualification tests prescribed by the National Certified Pipe Welding bureau (or by another reputable testing laboratory or agency) using procedures approved by the American Society of Mechanical Engineers or the American Welding Society. The welders will be required to pass qualification tests when the work of the welder creates a reasonable doubt as to his proficiency. Tests shall be conducted at no additional expense to the Owner.
2. Each welder shall, in addition to having passed the prescribed qualification tests (as noted in Paragraph 1.30.A.1), prepare sample coupons at the job site on a portion of pipe that is cut such that the cross section of the weld is open to view. The sample weld should be prepared using a 6 inch diameter pipe. The sample shall reflect a continuous weld with perpendicular cut out to show the weld in cross sectional view. This sample, when accepted and approved by a certified welding inspector, shall be used as a standard of quality to compare to other welds that this welder will be performing on the job. This same sample weld will also be a basis for accepting or rejecting the welder for working on this project. The sample weld shall be identified with a date and the welder's name and shall be kept at the site throughout the project.

3. All welding on pressure piping shall conform to all of the requirements of the American Society of Mechanical Engineers Code for Pressure Piping - B31.1 (An American National Standards Institute publication), as defined in the latest edition of the ANSI Power Piping B31.1 Manual. All welding shall also conform to all of the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. All chapters, current addenda and supplements of these manuals shall apply. This code shall be used to establish standards of performance and quality of welds. However, the Owner reserves the right to perform radiographic testing of all welds, to compare any of the welds to the approved "standard" sample welds of each welder, and to compare the welds to the welding diagrams and sketches of those recommended in the ANSI B31.1 Power Piping Manual. The intent is to obtain the highest quality welding job possible. The cost of any initial radiographic testing, for random inspection, shall be paid for by the Owner. If radiographic random testing reveals that a weld is defective, the Contractor shall bear the cost of all repairs and re-testing necessary to be made to subject weld until conformance with radiographic tests is reached. The potential for random radiographic testing and welding quality control applies to all pressure piping systems in this project, including systems below 100 psig. If a question should arise regarding the possibility of faulty welding or if there are obvious visual defects in the welding, the Contractor shall be required to correct such deficiencies to a quality level consistent with the recommendations, welding diagrams and sketches in the ANSI B31.1 Manual. The quality level shall also reflect that of the approved sample welds accomplished by each welder for this particular project.

1.30 TESTING FOR PIPING SYSTEMS

A. General: Before insulation is applied, all piping, equipment, and accessories installed under this contract shall be inspected and tested by the Contractor. All labor, material, and equipment required for testing shall be furnished by the Contractor. The Contractor shall be responsible for all repairs and retesting as required. All instruments and other equipment whose safe pressure range is below that of the test pressure shall be removed from the line or blanked off before applying tests. Prior to performing tests, all lines shall be "blown" free of all loose dirt and foreign particles. The lines shall then be thoroughly flushed with water (liquid lines only) at a sufficient flow rate and period of time, to ensure complete cleaning of the lines of all dirt, scale, and foreign matter. Satisfactory flushing of the lines shall be subject to approval. After testing and flushing lines, all filters and strainers shall be cleaned.

B. Safety: Since the Risk of failure, with the attendant possibility of injury, is appreciable greater with further testing, all safety measures required by codes or ordinance or reasonable applicable to the situation shall be taken.

C. Concealment: Equipment or piping to be pressure tested shall not be insulated, covered, or concealed prior to that test. Compression joint underground piping may be backfilled prior to pressure test except that joints shall remain exposed until after the test, but tie rods, clamps, etc., shall be in place and fastened.

D. Pressure Ratings: These tests shall not be used to establish pressure ratings.

E. System Protection: Protect all piping and equipment against overpressure, collapse from vacuum, and hydraulic shock during the filling, testing and draining procedures. Seats of iron valves shall not be subjected to a pressure in excess of the maximum cold working pressure of the valve. Pressure tests against other closed valves shall not exceed twice the normal rating. Note that where significant differences in elevation exists, there is a risk of overpressure in the lower portions of the system in order to attain test pressure in the upper portion of the system

F. Test Temperature: Apply test pressure only after the system and test medium are at approximately the same temperature, preferably not less than 60°F. Note that some applicable codes require testing above a specified minimum temperature.

G. Sectionalizing: Systems may be separated into sub-systems for testing if such action will expedite or simplify the testing.

H. Temporary Supports: During hydrostatic testing of lines provide temporary supports to prevent overstressing supports or hangers. When tests are completed, remove all temporary supports, locks, stops, etc., and adjust supports for their cold load and alignment.

I. Testing: Domestic hot and cold water piping and heating water piping shall be tested hydrostatically at the test pressures specified and shall show no drop in pressure in a 2 hour period. Leaks shall be located by soap testing
   1. Test Pressures:
      a) Condenser or Tower Water Supply & Return: 100 psig.
      b) Heating Water Supply and Return: 100 psig.
      c) Chilled Water Supply and Return: 100 psig.

J. Test Report
   1. A detailed report of pressure tests on piping and equipment shall be forwarded in duplicate to the Architect/Engineer. This report shall show date of test, lines tested, test medium, length of time test pressure was held, pressure drop or rise, and extent of venting or repressurizing.

1.31 COOPERATION WITH OTHER TRADES

A. The Contractor shall refer to other sections of these specifications covering the work of other trades which must be carried out in conjunction with the mechanical work so that the construction operations can proceed without harm to the Owner from interference, delay or absence of coordination.

1.32 FIELD MEASUREMENTS

A. The Contractor shall verify the dimensions covering the mechanical work at the building. No extra compensation shall be claimed or allowed on account of difference between actual dimensions and those indicated on the drawings. He shall examine the adjoining work on which Mechanical work is dependent for maximum efficiency and shall report any work which must be corrected. No waiver of responsibility for defective work shall be claimed or allowed due to failure to report unfavorable work conditions affecting Mechanical work.

1.33 SAFETY GUARDS

A. The Mechanical Contractor shall furnish and install safety guards required in order to obtain certificates of inspection from all authorities having jurisdiction. All belt driven equipment, projecting shafts, and other rotating parts shall be enclosed or adequately guarded. Provide coupling guards on all rotating shafts.

1.34 PROTECTION

A. All work, equipment, and materials shall be protected at all times to prevent obstruction, damage, or breakage. All pipe openings shall be closed with caps or plugs during installation. All equipment shall be covered and protected against dirt, water, chemical, or mechanical injury. At the completion of the work, all equipment shall be thoroughly cleaned and the entire system shall be delivered in a perfect, unblemished condition.

1.35 PAINTING AND IDENTIFICATION

A. All equipment shall be delivered to the job with suitable factory finish. Should the finish be marred in transit or during installation, it shall be finished to present a neat, workmanlike appearance.

B. Except as elsewhere hereinafter specifically required, any painting of equipment, piping, ductwork, grilles, insulation, etc., furnished and installed under this Section of the Specifications will be done by the Painting Contractor. However, the Mechanical Contractor shall leave his equipment clean and free from any grease, dirt, rust, etc., and in suitable condition for painting.

C. No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during the painting operation.

D. The piping shall be painted the basic color as indicated in other sections of these specifications and shall be marked every 10 feet on centers with Brady pipe markers. Arrows, approximately 6 inch in length and spaced about 10 feet on centers shall indicate the direction of the flow pipe. Locate additional labels as required in Mechanical Rooms. Staple in place, brush with clear lacquer. Markers shall state pipe size, flow direction, and pipe usage (such as "cold water," etc.).

1.36 RECORD DRAWINGS

A. The Contractor shall, during the execution of the work, maintain a complete set of drawings upon which all dimensional locations of equipment piping and all deviations and/or changes in the work shall be recorded. Water, storm, and drainage mains shall be delivered to the Architect/Engineer in good condition upon the completion and acceptance of the work and before final payment is made.

1.37 SUPPLIER RESPONSIBILITY

A. Each supplier, whether furnishing equipment as specified or as a substitution shall be responsible for certifying that the equipment is properly installed and that the warranty is valid. Submit written reports on the installation and the equipment performance when requested to do so by the Architect/Engineer (or his representative). Each supplier shall

be responsible for furnishing qualified personnel at the job site at anytime requested by the Architect/Engineer (or his representative) during the construction or warranty periods.

END OF SECTION

SECTION 23 0513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. It is the intent of this specification to define all motors furnished under all sections of the specifications for this project which will provide efficient operation, reliability, ease of maintenance, and repair along with reduced operation costs.

B. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion-proof when located in hazardous atmospheres.

C. Motors mounted in direct sun shall be provided with a shield to forbid direct radiation from the sun when the sun is 45 degree or greater above the horizon.

D. All supply fan motors mounted in air handling units shall have Class F insulation.

E. Open drip-proof motors shall be NEMA design B with Class B insulation and a 1.15 service factor with 40 degree C ambient and a total temperature rise of 65 degree C.

F. TEFC motors shall be NEMA design B with Class F insulation and a 1.15 service factor with 40 degree C ambient and a total temperature rise of 65 degree C.

G. Severe duty motors shall be NEMA design B with Class F insulation and a 1.15 service factor with 40 degree C ambient and a total temperature rise of 65 degree C.

1.3 GENERAL

A. All motors covered by this specification shall conform to all applicable requirements of NEMA, IEEE, ANSI and NEC Standards. They shall be free from defective material and workmanship and fully capable of performing in accordance with the manufacturer's nameplate rating.

B. Motors shall be approved by Underwriter's Laboratories (UL) for the service specified.

C. Unless otherwise specified, motors shall be suitable for operation in either direction--(CW or CCW) or rotation.

D. Motors shall be Westinghouse II, Reliance XE, Gould E-PLUS, GE Energy Savery, or approved equal.

E. All fractional H.P. motors shall be permanent split capacitor (P.S.C.) with U.L. listed overload protection. The protector shall be calibrated to trip out when the winding reaches a pre-determined temperature and automatically reset when the temperature returns to a safe limit.

1.4 EFFICIENCY

A. All motors shall be special high efficiency design. These motors shall be different than manufacturers' standard product, in that losses are reduced by incorporation of design features including the use of low loss lamination steel, increase in stator/rotor length, increase in copper windings, utilization of high efficiency ventilating fan, computer optimized slot configuration and air gap.

B. All motors shall be all copper wound, high power factor, high efficiency motors. Motor efficiency shall be as determined by IEEE Standard 112A, test method B. Test results shall be submitted to the Engineer.

C. Manufacturer to furnish % efficiency, % PF, amps at Full Load, 3/4 Load, and 1/2 Load with quotation and be prepared to furnish actual test results on individual ratings if required.

PART 2 – PRODUCTS

2.1 GENERAL

A. Motors shall be 60 Hertz voltage as indicated on drawings, Squirrel Cage induction type suitable for across-the-line starting and continuous duty.

B. Motors shall have copper windings.

C. All motors shall be suitable for application without exceeding Class B rise in ambient temperatures up to and including 65 degree C at 1.15 Service Factor. Motor nameplates shall state suitability for 65 degree C ambient application.

D. All motors shall be suitable for application without exceeding Class B temperature rise at altitudes up to and including 9900 feet at a 1.00 Service Factor.

E. Motors shall operate successfully under running conditions at rated load with +10% of rated voltage or +5% of rated frequency or a combined variation in voltage and frequency of +10% (sum of absolute values).

F. Motors will have at least a nominal 85% power factor rating at full load and rated voltage. Exclusion from this requirement are motors which draw less than 1,000 watts at full load and motors with synchronous speeds less than 1800 RPM. Test verification shall be available upon request.

2.2 INSULATION

A. Motors shall have non-hygroscopic Class B or Class F insulation system as required, however, temperature rise shall not exceed Class B rise at rated load per NEMA Standards.

B. The insulation system shall be provided with sufficient treatment so that the completed insulation system will have a minimum resistance of 1.5 megohms after 168 hours of testing to a humidity chamber maintained at 100% relative humidity and 40 degree C ambient.

2.3 TESTS

A. Each motor shall be given a routine factory test per NEMA and ASA Standards to ensure compliance with this specification.

2.4 BEARINGS

A. Bearings shall be shielded, regreasable, vacuum degassed steel ball bearings, specially selected for electric motor service and long life expectancy (B-10 MINIMUM).

B. Bearings shall be lubricated with a premium moisture resistant grease formulated to operate over a temperature range of -20 degree F to +300 degree F.

C. Bearing identification by AFBMA number shall be shown on motor nameplate.

2.5 ENCLOSURES

A. Construction shall be of rugged corrosion resistant metal including a one-piece frame, brackets, conduit box and fan shroud.

B. Fans shall be bi-directional and constructed of low inertia inert material.

2.6 CONDUIT BOXES

A. Conduit boxes are to be diagonally split, rotatable in 90 degree turns, gasketed cast iron construction with threaded conduit holes.

B. Ground lug suitable for grounding motor frame shall be furnished inside of conduit box.

C. A neoprene lead seal separator gasket shall be mounted between motor frame and conduit box to prevent entry of moisture and dust into the motor.

D. Conduit box size must meet or exceed minimum as shown in NEC Standards based on motor full load current.

2.7 HARDWARE

A. Corrosion-resistant cadmium plated grease plugs shall be provided for relubrication of bearings.

B. An external shaft flinger shall be provided on the shaft to prevent entrance of moisture or dust into the bearings.

C. All motors Frame 182T and larger shall have lifting eyebolts for lifting the entire motor.

D. An easy-to-read nameplate shall be provided on each motor and shall include at least the following information:
1. Horsepower
2. RPM
3. NEMA Design
4. Phase
5. Hertz
6. Service Factor
7. Ambient Temperature
8. Frame Size
9. Duty
10. Class of Insulation
11. Locked KVA Code
12. Full Load Amps
13. Model or Catalog Number
14. Bearing Identification
15. Guaranteed Minimum Efficiency
16. Nominal Efficiency
17. Voltage

2.8 MOTOR CONSTRUCTION

A. Motors shall be dynamically balanced to limits as indicated below:

Speed	Maximum Amplitude (Peak-to-Peak)
3500 & Above	.0010
1700 to 3499	.0015
Less than 1700	.0020

2.9 FINISH

A. All external surfaces shall be prime painted with red oxide zinc chromate primer to prevent corrosion.

B. The finish coat of paint shall be a full-gloss epoxy enamel paint. External finish shall protect against moisture and have superior heat resistance to withstand the effects of sunlight and outdoor weathering without chipping or cracking.

2.10 EFFICIENCY

A. Motors furnished shall meet or exceed the efficiency listed on the following Table.

HIGH EFFICIENCY MOTORS

HP	3600 RPM EFFICIENCY		1800 RPM EFFICIENCY		1200 RPM EFFICIENCY	
	NOMINAL	MINIMUM	NOMINAL	MINIMUM	NOMINAL	MINIMUM
1	81.5	78.5	84.0	81.5	78.5	75.5
1.5	81.5	78.5	84.0	81.5	84.0	75.5
2	84.0	81.5	84.0	81.5	86.5	84.0
3	86.5	84.0	88.5	86.5	88.5	86.5
5	88.5	86.5	90.2	88.5	88.5	86.5
7.5	88.5	86.5	90.2	88.5	88.5	86.5
10	88.5	86.5	90.2	88.5	90.2	88.5
15	90.2	88.5	91.7	90.2	90.2	88.5
20	90.2	88.5	91.7	90.2	91.7	90.2
25	90.2	88.5	93.0	91.7	91.7	90.2
30	91.7	90.2	93.0	91.7	91.7	90.2
40	91.7	90.2	93.0	91.7	93.0	91.7
50	91.7	90.2	94.1	93.0	93.0	91.7
60	93.0	91.7	94.1	93.0	93.0	91.7
75	94.1	93.0	94.1	93.0	94.1	93.0
100	94.1	93.0	95.0	94.1	94.1	93.0
150	94.1	93.0	95.0	94.1	94.1	93.0
200	94.1	93.0	95.0	94.1	95.0	94.1
250	95.0	94.1	95.0	94.5	-	-

END OF SECTION

SECTION 23 0519

PIPING SPECIALTIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The Contractor shall furnish and install all piping specialties necessary for satisfactory operation of the systems.

B. Manual air vents shall be installed at all high points in heating and cooling water piping systems and as shown on the contract drawings.

C. Valves shall be installed in all primary and secondary plumbing loops and branch lines feeding groups of fixtures in order to isolate such loops and branches without disrupting the service as a whole.

D. Unions shall be installed where necessary to facilitate maintenance of pumps, valves, regulators and other specialties.

E. Dielectric unions shall be installed wherever dissimilar metals are joined, except valves in closed loop piping systems.

1.3 RELATED WORK IN OTHER SECTIONS

220523 - VALVES
220700 - PIPING INSULATION
221000 - PIPE AND PIPE FITTINGS
221113 - DOMESTIC WATER SYSTEMS
221123 - NATURAL GAS PIPING SYSTEMS
221313 - SOIL AND WASTE PIPING SYSTEMS
230000 - HEATING, VENTILATING, AND AIR CONDITIONING INDEX
230500 - GENERAL HEATING, VENTILATING AND AIR CONDITIONING REQUIREMENTS
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230548 - VIBRATION ISOLATION AND EXPANSION COMPENSATION

PART 2 – PRODUCTS

2.1 STRAINERS

A. Mueller Steam Specialty model 352M cast bronze, threaded ends, y-strainer, 20 mesh stainless steel screens for water service and .033” dia. opening screens for steam service. Provide blow-off valves full size of strainer tapping with drain lines to nearest drain.

B. Mueller Steam Specialty model 752, 250 SWP, flanged for size 2-1/2" and larger with 1/16" dia openings screen for water and 3/64" dia openings stainless steel screen for steam. Provide blow-off valves full size of strainer tapping with drain lines to nearest drain.

2.2 PRESSURE GAUGES

A. Marshalltown "Permagage", Ashcroft "Duragage", "Trerice No. 500X, or approved equal. Dials shall be 4-1/2" unless otherwise noted. Proved needle valve for each gauge, and syphon for each steam gauge. Pressure gauges shall be range noted on plans or at mid range of service (as shown on drawings).

2.3 THERMOMETERS

A. Where indicated on the drawings and the piping diagrams, thermometers shall be installed as manufactured by the H.O. Trerice Co., Mueller, Albert Weiss, or approved equal. Thermometers shall be provided with expansion heads so that thermometer will not break under extremes of temperature. Each thermometer shall be provided with a separable socket well which shall be place in the piping system. The well shall be the length required for accurate reading of the thermometer.

2.4 AIR VENTS

A. Manual air vents shall be 1/2" brass ball valves, Nibco No. T-585-70 or approved equal.

2.5 THERMOMETER WELLS

A. Machined brass test wells with screwed caps and chains. H.O. Trerice No. 5573 or 5574 as required or approved equal.

B. Temperature and Pressure Test Plugs: Furnish pressure and temperature test plugs at all locations as shown on the drawings and at every connection to each piece of equipment. These test plugs shall be furnished with a Nordel valve core and 1/2" NPT brass body complete with gasket cap.

C. Furnish 4 each thermometers and pressure gauges for use by the Owner for checking temperatures and pressures.

2.6 INSULATING UNIONS

A. Insulating unions having a plastic insert for electrical isolation shall be similar to EPCO Sales Company.

PART 3 -EXECUTION

3.1 INSTALLATION

A. All specialties shall be installed in accordance with the best standard practices and as recommended by the manufacturer.

B. Where thermometers or test fittings occur in insulated piping systems or on insulated equipment, extension necks shall be provided to extend beyond the insulation.

C. Dielectric union shall be installed wherever piping of dissimilar metallic material is connected. Insulating unions are not required between bronze valve bodies and connecting steel pipe in closed loop systems such as heating and chilled water systems.

END OF SECTION

SECTION 23 0548

VIBRATION ISOLATION AND EXPANSION COMPENSATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Vibration Isolation: All vibration isolation equipment including flexible pipe and duct connections hangers and bases shall be under the direct supervision of the vibration isolation manufacturer's representative. This specification provides the necessary design criteria to avoid excessive noise or vibration due to the operation of machinery, connecting piping, ductwork or conduit.

1.3 RELATED WORK IN OTHER SECTIONS

220523 - VALVES
220700 - PIPING INSULATION
230000 - HEATING, VENTILATING, AND AIR CONDITIONING INDEX
230500 - GENERAL HEATING, VENTILATING, AND AIR CONDITIOING REQUIREMENTS
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230519 - PIPING SPECIALTIES
232113 - HYDRONIC PIPING SYSTEMS

1.4 CONTRACTOR RESPONSIBILITY

A. The Contractor shall provide a submittal to the Architect/Engineer for approval prior to any installation of his equipment containing the following information:
   1. Catalog cuts and data sheets on specific vibration isolators to be utilized showing compliance with this specification and the recommendation of the isolator manufacturer as to suitability for the specific service.
   2. An itemized list showing the items of equipment, piping and ductwork to be isolated, the isolator type and model number selected, isolator loading and deflection, and reference to specific drawings showing equipment frame construction where applicable.
   3. Drawings showing equipment frame construction for each machine, including dimensions, structural member sizes, support point locations, etc.
   4. Written approval of the frame design to be used, obtained from the equipment manufacturer.
   5. Drawings showing methods of suspension, support, guides, etc., for piping and ductwork.
   6. Drawings showing methods for isolation of piping and ductwork piercing walls, slabs, beams, etc.
   7. The Contractor shall bring to the Architect/Engineer's attention prior to installation any conflict with other trades which will result in unavoidable contact

to the equipment, piping, etc., described herein, due to inadequate space. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.

8. The Contractor shall bring to the Architect/Engineer's attention any discrepancies between the specifications and field conditions, changes required due to specific equipment selection, etc., prior to installation. Corrective work necessitated by discrepancies after installation shall be at the expense of the Contractor.
9. The Contractor shall obtain inspection and approval from the Architect/Engineer of any installation to be covered or enclosed prior to such closure.
10. The Contractor shall obtain written and/or oral instructions from the vibration isolation manufacturer as to the proper installation and adjustment of vibration isolation devices; alternatively the equipment may be installed by the vibration isolation manufacturer.
11. The Contractor shall correct, at no additional cost, all installations which are deemed defective in workmanship or materials by the contracting officer.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

Vibration isolation equipment shall be as manufactured by Flexonics, Kinetics, Mason Industries, Vibration Eliminator, Co., or approved equal.

2.2 ISOLATOR TYPES

A. Spring Type

1. All spring isolators shall have either known undeflected heights or other markings so that, after adjustment, when carrying their load the deflection under load can be verified, thus determining that the load is within the proper range of the device and that the correct degree of vibration isolation is being provided according to the design.
2. All spring isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer and must be linear over a deflection range 50% above the design deflection.
3. The ratio of lateral to vertical stiffness shall not be less than 1.0 or greater than 1.6.
4. The vertical natural frequency for each support point, based upon the load per isolator, and isolator stiffness, shall not differ by more than plus or minus 10%.
5. Type MS shall be bare spring type (without housings or snubbers) equipped with leveling bolts and with two layers of ribbed or waffled neoprene pad separated by a 1/16 " galvanized steel plate under the base plate.
6. Type HS shall be suspension hanger having a steel frame and spring element in series with a neoprene pad or washer. The isolator shall be designed so hanger rod may be misaligned 15 relative to the vertical without touching hanger box frame.

B. Neoprene Pad Type

1. Type MN shall be a neoprene isolator unit having a minimum static deflection of 1/4" and show hardness of 40 to 65 after minimum aging.

C. Flexible pipe connectors shall consist of a minimum 12 inch length of metal reinforced or corrugated flexible metal hose of appropriate pressure and temperature rating with end connections suitably for the adjacent piping system. Connectors shall be Flexonics type MMT FLG or Vibrasorber or approved equal.

D. Flexible duct connectors shall be neoprene coated glass fabric, ventglass or equal. See Section 233000 AIR DISTRIBUTION.

2.3 EQUIPMENT FRAMES AND BASES

A. General
1. Equipment frames and base shall be furnished and installed where specifically shown on the drawings and at other locations recommended by the isolator manufacturer. In general rigid steel frames will be required for base mounted pumps, 30 HP and smaller, air handling units, some fans 30 HP and smaller, water chillers, cooling towers. Concrete inertia bases shall be furnished and installed for base mounted pumps 40 HP and larger and fans 40 HP and larger.

B. Rigid Steel Frames
1. Mounting frame and/or brackets shall be provided to carry the load of the equipment without causing mechanical distortion or stress to the equipment.
2. The mounting frames shall consist of welded wide flange of channel structural steel with welded brackets to accept the isolators. The section depth of the frame member shall be greater than 1/10 the length of the longest frame member.

PART 3 – EXECUTION

3.1 GENERAL

A. Location: Vibration isolation equipment shall be installed at the following locations and at other locations recommended by the isolator manufacturer or required to reduce transmitted vibrations to a level acceptable to the Architect/Engineer and Owner.
1. All reciprocating or rotating equipment such as fans, AHU's, forced draft boilers, chiller, cooling towers, furnaces, pumps and compressors except as follows:
a) Equipment installed on slab on grade construction.
b) AHU's having factory installed internal spring isolation at fans.
c) Inline pumps having motors 1/2 HP or smaller.
2. At all connections between rotating equipment and piping or ductwork.
3. All piping and ductwork within mechanical equipment rooms or within 10 feet of connections to rotating or reciprocating equipment.

B. The Contractor shall install equipment and piping avoiding rigid contact with the building structure.

C. The Contractor shall coordinate his work with other trades to assure rigid contact between the building structure and mechanical equipment and piping is minimized.

3.2 INSTALLATION

A. Large Equipment

1. Objective: Installation of vibration isolators shall not result in any change of position of equipment or piping which would result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, equipment and piping shall be maintained in a rigid position during installation. Equipment shall be shimmed into final, loaded position prior to making piping connections. Equipment load shall not be transferred to the isolator until the installation is complete and the equipment is under full operational load. This is particularly important where equipment installation weight is substantially different from operating weight such as cooling towers, chillers, boilers, air washers and evaporative coolers which operate with substantial water content.
2. The machine to be isolated shall be supported by a structural steel frame or concrete inertia base.
3. Brackets shall be provided to accommodate the isolator and provide a mechanical stop. The vertical position and size of the bracket shall be specified by the isolator manufacturer.
4. The operating clearance at steel frames between the bracket and the pad or floor shall be 3/8 inch, plus or minus 1/16 inch. The minimum operating clearance between the frame and the housekeeping pad or floor shall be one inch.
5. The frame shall be placed in position and the brackets supported temporarily by 3/8-inch shims prior to the installation of the machine or isolators.
6. The isolators shall be installed without raising the machine and frame
7. After the entire system installation is completed and under full operational load, the isolator shall be adjusted so that the load is transferred from the shims to the isolator. When all isolators are properly adjusted the shims will be barely free and shall be removed. Thereafter, the shims will be used as a gauge to check that the 3/8-inch clearance is maintained so that the system will remain free of stress.

B. Pipe And Duct Hangers
1. General: Vertical rise and horizontally supported piping connected to reciprocating or rotating equipment are included herein. Domestic water and fire standpipe systems are excluded from this section of the specifications.
2. Pipe and duct hangers shall be suspended from spring isolators within mechanical equipment rooms and within 10 feet of connections to rotating or reciprocating equipment.
3. The isolators shall be installed with the isolator hanger box as close as possible to the structure.
4. The isolators shall be suspended from substantial structural members, not from slab diaphragms unless specifically approved.
5. Hanger rods shall be aligned to clear the hanger box.
6. Horizontal suspended pipe 2" and smaller shall be suspended by HS isolator type with a minimum 1.0-inch static deflection. Pipes larger than 2" shall be the same except with a minimum of 1-1/2" static deflection.
7. Horizontal pipe floor supported at slab shall be supported via Type MS with a minimum static deflection of 1.0 inch.
8. Vertical riser pipe supports shall utilize Type MS mounts selected for a minimum static deflection of 1.5 inches.
9. Vertical riser guides, if required, shall utilize Type MN mounts to avoid direct contact of piping with building.
10. Pipe sway braces where required shall utilize two neoprene elements (Type MN) to accommodate tension and compression forces.

11. Hanger rods for all equipment, pipes, ducts, trapezes, vibration isolators, etc., shall be installed straight, true and plumb. Do not bend or flex hanger rods to accommodate sloping structures, avoid obstacles, or for any other purpose. Where necessary, utilize swivel beam clamps, beveled or swivel hardware, angled, swivel or hinged brackets spanning members or other appropriate means of connection.

C. Pipe Clamps:
1. All piping whether or not spring isolated hangers are used, shall be supported with a resilient wrapping or clamp system employing a resilient element of wool felt, neoprene or other suitable material.

D. Flexible pipe connectors shall be installed between each piece of rotating or reciprocating piece of equipment and the distribution piping system.

E. Flexible duct connectors shall be installed between each unit containing a fan and the distribution ductwork. Allow at least 1" slack in fabric connectors. Fabric may be attached to ductwork by folding into the sheet metal or attaching with metal flanges.

F. Flexible duct connectors for kitchen hood exhaust systems shall be slip joint type with high temperature resilient packing material.

END OF SECTION

SECTION 23 0593

BALANCING OF MECHANICAL SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish all labor, materials and equipment required to test and balance the mechanical systems identified on the contract drawings and these specifications, including but not limited to:
   1. Testing, adjustment, and balancing of hydronic, steam, and refrigerating systems.
   2. Measurement of final operating condition of HVAC systems.
   3. Sound measurement of equipment operating conditions.
   4. Vibration measurement of equipment operating conditions.
   5. Adjustment of the mechanical systems shall include but not limited to impellers trimmed, new sheeves and belts to match cfm required, etc. as required to match equipment specified.
   6. Operating Test

1.3 RELATED SECTIONS

230000 - HEATING, VENTILATING AND AIR CONDITIONING INDEX
230100 - DEMONSTRATION AND TRAINING
230500 - GENERAL HEATING, VENTILATING, AND AIR CONDITIONING REQUIREMENTS
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
233000 - AIR DISTRIBUTION
251000 - DIRECT DIGITAL CONTROLS (DDC) SOFTWARE AND COMPONENTS.
251100 - ELECTRICAL CONTROLS AND INTERLOCKS
253000 - CONTROLS AND INSTRUMENTATION

1.4 REFERENCES

A. The publications listed below form a part of these specifications to the extent referenced. Each publication shall be the latest edition of each except as noted.
   1. AABC - National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning System.
   2. ADC - Test Code for Grilles, Registers, and Diffusers.
   3. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
   4. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
   5. NFPA – NFPA 90A - Installation of Air Conditioning and Ventilating System.
   6. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.5 SUBMITTALS

A. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

B. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

C. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.

D. Provide reports in letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets and indicating thermostat locations.

E. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

F. Test Reports: Indicate data on AABC National Standards for Total System Balance forms.

G. When test and balancing has been completed, the balancing agency shall prepare a complete report including design and test conditions compared. The report shall be as outlined below.

H. Seven copies of the complete and compiled test data shall be submitted to the Contractor for forwarding to the Architect/Engineer for evaluation and approval.
   1. The Report shall be on standard 8-1/2” x 11” good quality paper and bound together to form a complete report. All forms shall be typewritten. Field data may be handwritten on appropriate printed or typewritten forms. Copies of handwritten field notes shall be legible.
   2. Each sheet shall have the Building number, name of the Testing Firm, instruments used to perform the tests, name of personnel performing the test, and date test was performed. Date and firm performing the calibration on photometry equipment shall also be included.
   3. Outside weather conditions shall be noted during the times the tests were made; cloud cover, temperature, wind speed and direction, precipitation, etc.

I. The Report shall have a T & B Summary section including:
   1. Identification of any system or equipment item the Contractor had difficulty balancing to specification or could not be balanced to specification.
   2. Identification of any piece of equipment or system whose balance should be rechecked and/or reset during weather conditions different from those present during system balancing.

1.6 PROJECT RECORD DOCUMENTS

A. Record actual locations of flow measuring stations balancing valves and rough setting. Show locations on Test and Balance report reduced size plan drawings.

1.7 QUALITY ASSURANCE

A. Perform total system balance in accordance with NEBB Procedural Standards for Testing, Balancing, and Adjusting of Environmental Systems.

1.8 QUALIFICATIONS

A. The balancing shall be performed by Energy Balance, Inc., De La Pena LLC, or Kirk Air. Qualified personnel are limited to registered mechanical Engineers and agencies regularly engaged in testing and balancing work. The Contractor shall submit, prior to the start of the balancing work, the qualifications and experience record of the balancing personnel for approval by the Architect/Engineer.

B. Perform Work under supervision of registered Professional Engineer experienced in performance of this Work and licensed in the state where the Project is located.

C. The balancing agency shall not be associated with or the same contractor furnishing the controls or instrumentation.

1.9 PRE-BALANCING CONFERENCE

A. Convene pre-balancing conference one week prior to commencing work of this section in coordination with Architect/Engineer/General Contractor and his Subcontractors.

1.10 SEQUENCING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project. See section 3.1 for pre-balancing inspection.

PART 2 – PRODUCT

2.1 INSTRUMENTS

A. Instruments in general shall be direct reading. Pressures between 2" W.G. and 12" W.G. shall be measured with manometers. Duct velocities above 600 fpm shall be measured with a pitot tube. Averaging hoods with tight seal shall be used for airflow measurement at diffusers, registers and grilles. RPM shall be measured with a revolution counter and stopwatch. Mercury thermometers are preferred; bi-metallic thermometers may be used if calibration is checked daily. Test report shall list all instruments used and include accuracy and date calibrated. The Contractor shall provide all instruments to make the tests herein specified and required for complete system balancing.

2.2 AIR HANDLERS

A. After the air system is balanced and an optimum fan speed is selected, the adjustable sheaf or sheaves furnished shall be replaced by the Mechanical Contractor with new non-adjustable sheaves for permanent operation.

2.3 PUMPS

A. After the water system is balanced and an optimum pump operating point is selected, the pump impeller shall be trimmed to supply the required capacity for pumps over 2 HP, without throttling the flow.

PART 3 – EXECUTION

3.1 EXAMINATION

A. The test and balance agency shall review the plans and specifications prior to installation of the system and submit a report to the Architect/Engineer of any deficiencies in the system which could preclude proper adjusting, balancing and testing of the system.

B. The test and balance agency shall inspect the system prior to adjusting, balancing, and testing work to insure that all specified components which will affect proper execution of such work are installed and are operating properly. A report shall be submitted to the Architect/Engineer indicating the results of the inspection within three days of the inspection. The following is a partial list of items to be inspected and report provided to the Architect/Engineer.

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems and control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire/smoke and volume dampers are in place and open. The smoke detectors and power to them is installed and the dampers are operational. Air coil fins are cleaned and combed.
8. Access doors are closed and duct end caps are in place.
9. Air outlets are installed and connected.
10. Duct system leakage is minimized.
11. Hydronic systems are flushed, filled, and vented.
12. Pumps are rotating correctly.
13. Proper strainer baskets are clean and in place.
14. Service and balance valves are open.

C. Submit field reports in a timely manner within one week of pre-balancing conference. Report defects and deficiencies noted during performance of services which prevent system balance.

D. Beginning of work means acceptance of existing conditions of the installed system and equipment on the project.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.6 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.7 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing
   1. Electric Water Coolers
   2. Plumbing Pumps
   3. HVAC Pumps
   4. Packaged Boilers
   5. Reciprocating Water Chillers
   6. Air Cooled Water Chillers
   7. Air Cooled Refrigerant Condensers

8. Packaged Roof Top Heating/Cooling Units
9. Packaged Terminal Air Conditioning Units
10. Unit Air Conditioners
11. Air Coils
12. Terminal Heat Transfer Units
13. Induction Units
14. Air Handling Units
15. Fans
16. Air Filters
17. Air Terminal Units
18. Air Inlets and Outlets
19. Controls Compressor

B. Report Forms
1. Title Page
   a) Name of Testing, Adjusting, and Balancing Agency
   b) Address of Testing, Adjusting, and Balancing Agency
   c) Telephone number of Testing, Adjusting, and Balancing Agency
   d) Project name
   e) Project location
   f) Project Architect
   g) Project Engineer
   h) Project Contractor
   i) Project altitude
   j) Report date
2. Summary Comments
   a) Design versus final performance
   b) Notable characteristics of system
   c) Description of systems operation sequence
   d) Summary of outdoor and exhaust flows to indicate amount of building pressurization
   e) Nomenclature used throughout report
   f) Test conditions, including weather conditions
3. Instrument List:
   a) Instrument
   b) Manufacturer
   c) Model number
   d) Serial number
   e) Range
   f) Calibration date
4. Electric Motors:
   a) Manufacturer
   b) Model/Frame
   c) HP/BHP
   d) Phase, voltage, amperage; nameplate, actual, no load
   e) RPM
   f) Service factor
   g) Starter size, rating, heater elements
   h) Sheave Make/Size/Bore
5. V-Belt Drive:
   a) Identification/location

b) Required driven RPM
c) Driven sheave, diameter and RPM
d) Belt, size and quantity
e) Motor sheave diameter and RPM
f) Center to center distance, maximum, minimum, and actual

6. Pump Data:
   a) Identification/number
   b) Manufacturer
   c) Size/model
   d) Impeller
   e) Service
   f) Design flow rate, pressure drop, BHP
   g) Actual flow rate, pressure drop, BHP
   h) Discharge pressure
   i) Suction pressure
   j) Total operating head pressure
   k) Shut off, discharge and suction pressures
   l) Shut off, total head pressure
7. Gas Fired Equipment
   a) Manufacturer
   b) Model number
   c) Serial number
   d) Firing rate
   e) Overfire draft
   f) BTUH at sea level
   g) BTUH at altitude
   h) Gas pressure at meter outlet
   i) Gas flow rate in cfh
   j) Heat input
   k) Burner manifold gas pressure
   l) Orifice size
   m) Air temperature rise for gas fired equipment
   n) Check all limit devices for proper operation, setting and calibration
   o) Make up water pressure setting
   p) Working pressure
   q) Ambient temperature
   r) Relief valve setting
   s) Static pressure
   t) Fan hydronic system and fan cfm
   u) Heat output
8. Air Cooled Condenser:
   a) Identification/number
   b) Location
   c) Manufacturer
   d) Model number
   e) Serial number
   f) Entering DB air temperature, design and actual
   g) Leaving DB air temperature, design and actual
   h) Number of compressors
9. Chillers:
   a) Identification/number

b) Manufacturer
c) Capacity
d) Model number
e) Serial number
f) Evaporator entering water temperature, design and actual
g) Evaporator leaving water temperature, design and actual
h) Evaporator pressure drop, design and actual
i) Evaporator water flow rate, design and actual
j) Condenser entering water temperature, design and actual
k) Condenser pressure drop, design and actual
l) Condenser water flow rate, design and actual

10. Cooling Coil Data:
    a) Identification/number
    b) Location
    c) Service
    d) Manufacturer
    e) Air flow, design and actual
    f) Entering air DB temperature, design and actual
    g) Entering air WB temperature, design and actual
    h) Leaving air DB temperature, design and actual
    i) Leaving air WB temperature, design and actual
    j) Water flow, design and actual
    k) Water pressure drop, design and actual
    l) Entering water temperature, design and actual
    m) Leaving water temperature, design and actual
    n) Saturated suction temperature, design and actual
    o) Air pressure drop, design and actual
11. Heating Coil Data:
    a) Identification/number
    b) Location
    c) Service
    d) Manufacturer
    e) Air flow, design and actual
    f) Water flow, design and actual
    g) Water pressure drop, design and actual
    h) Entering water temperature, design and actual
    i) Leaving water temperature, design and actual
    j) Entering air temperature, design and actual
    k) Leaving air temperature, design and actual
    l) Air pressure drop, design and actual
12. Air Moving Equipment
    a) Location
    b) Manufacturer
    c) Model number
    d) Serial number
    e) Arrangement/Class/Discharge
    f) Air flow, specified and actual
    g) Return air flow, specified and actual
    h) Outside air flow, specified and actual
    i) Total static pressure (total external), specified and actual
    j) Inlet pressure

k) Discharge pressure
l) Sheave Make/Size/Bore
m) Number of Belts/Make/Size
n) Fan RPM

13. Return Air/Outside Air Data:
    a) Identification/location
    b) Design air flow
    c) Actual air flow
    d) Design return air flow
    e) Actual return air flow
    f) Design outside air flow
    g) Actual outside air flow
    h) Return air temperature
    i) Outside air temperature
    j) Required mixed air temperature
    k) Actual mixed air temperature
    l) Design outside/return air ratio
    m) Actual outside/return air ratio
14. Exhaust Fan Data:
    a) Location
    b) Manufacturer
    c) Model number
    d) Serial number
    e) Air flow, specified and actual
    f) Total static pressure (total external), specified and actual
    g) Inlet pressure
    h) Discharge pressure
    i) Sheave Make/Size/Bore
    j) Number of Belts/Make/Size
    k) Fan RPM
15. Duct Traverse:
    a) System zone/branch
    b) Duct size
    c) Area
    d) Design velocity
    e) Design air flow
    f) Test velocity
    g) Test air flow
    h) Duct static pressure
    i) Air temperature
    j) Air correction factor
16. Duct Leak Test:
    a) Description of ductwork under test
    b) Duct design operating pressure
    c) Duct design test static pressure
    d) Duct capacity, air flow
    e) Maximum allowable leakage duct capacity times leak factor
    f) Test apparatus
        1) Blower
        2) Orifice, tube size
        3) Orifice size

4) Calibrated
g) Test static pressure
h) Test orifice differential pressure
i) Leakage

17. Air Monitoring Station Data:
a) Identification/location
b) System
c) Size
d) Area
e) Design velocity
f) Design air flow
g) Test velocity
h) Test air flow

18. Flow Measuring Station:
a) Identification/number
b) Location
c) Size
d) Manufacturer
e) Model number
f) Serial number
g) Design Flow rate
h) Design pressure drop
i) Actual/final pressure drop
j) Actual/final flow rate
k) Station calibrated setting

19. Terminal Unit Data:
a) Manufacturer
b) Type, constant, variable, single, dual duct
c) Identification/number
d) Location
e) Model number
f) Size
g) Minimum static pressure
h) Minimum design air flow
i) Maximum design air flow
j) Maximum actual air flow
k) Inlet static pressure

20. Air Distribution Test Sheet:
a) Air terminal number
b) Room number/location
c) Terminal type
d) Terminal size
e) Area factor
f) Design velocity
g) Design air flow
h) Test (final) velocity
i) Test (final) air flow
j) Percent of design air flow

21. Sound Level Report:
a) Location
b) Octave bands - equipment off

c) Octave bands - equipment on

22. Vibration Test:
    a) Location of points:
        1) Fan bearing, drive end
        2) Fan bearing, opposite end
        3) Motor bearing, center (if applicable)
        4) Motor bearing, drive end
        5) Motor bearing, opposite end
        6) Casing (bottom or top)
        7) Duct after flexible connection (discharge)
        8) Duct after flexible connection (suction)
    b) Test readings:
        1) Horizontal, velocity and displacement
        2) Vertical, velocity and displacement
        3) Axial, velocity and displacement
    c) Normally acceptable readings, velocity and acceleration
    d) Unusual conditions at time of test
    e) Vibration source (if non-complying)

3.8 CALCULATIONS

A. The following calculations shall be made and become part of the reported data.
    1. The CFM at each heating, cooling, and fan coil, the heating and/or cooling capacity of each and the air temperature change of each.
    2. The water flow at each heating, cooling, and fan coil, the heating and/or cooling capacity of each and the water temperature change of each.
    3. The fuel flow to each gas fired unit and the BTUH input.
    4. The capacity of each refrigeration unit in BTUH or tons at full capacity and at each unloaded step.

3.9 OPERATING TEST

A. The test and balance agency shall coordinate and set up an operating test when Test & Balance is completed to ensure complete operation of the system in all modes. The controls contractor, sheet metal trade and the general contractor shall certify in writing test completion and all units are operating as designed. Attach copy of operating test to Test & Balance report.

END OF SECTION

SECTION 23 0713

DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and Install
   1. Ductwork insulation.
   2. Duct liner.
   3. Insulation jackets.

1.2 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section

1.3 DESCRIPTION OF WORK

A. Work Included: The work included by this specification consists of furnishing all labor, accessories, equipment and materials necessary for the installation of all insulation for ductwork and mechanical equipment in accordance with the specification and applicable drawings. This includes but is not limited to:
   1. All supply ductwork
   2. Return ductwork not within the conditioned space
   3. All ductwork in the mechanical room
   4. Outside air inlet ductwork that is within the conditioned space.
   5. Mechanical equipment not factory insulated.

B. Do not internally insulate ductwork from evaporative coolers unless specifically indicated on the drawings.

C. Exterior duct wrap insulation with vapor barrier shall be used on all outdoor air ductwork within conditioned spaces.

D. Supply and return air ductwork shall be insulated with duct liner except in air handling systems having air washers or humidifiers. Where air washers or humidifiers are used, exterior duct insulation shall be used. Where duct liner is used, dimensions shown on the drawings shall be clear inside duct liner.

E. Testing:
   1. All ductwork and mechanical equipment shall be tested for leakage and approved by the Architect/Engineer before any insulation is applied. The insulation contractor shall have this verified in writing before beginning work.

1.4 RELATED WORK IN OTHER SECTIONS

230000 - HEATING, VENTILATING, AND AIR CONDITIONING INDEX
230500 - GENERAL HEATING, VENTILATING, AND AIR CONDITIONING REQUIREMENTS
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
233000 - AIR DISTRIBUTION

1.5 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

D. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

E. ASTM E84 - Surface Burning Characteristics of Building Materials.

F. ASTM E96 - Water Vapor Transmission of Materials.

G. NFPA 255 - Surface Burning Characteristics of Building Materials.

H. SMACNA - HVAC Duct Construction Standards 1985 Ed. - Metal and Flexible.

I. UL 723 - Surface Burning Characteristics of Building Materials

1.6 DEFINITIONS

A. Exposed Location: Exposed in mechanical rooms or rooms with finished walls or ceilings.

B. Concealed Location: Located in pipe chase, furred spaces, attics, crawl spaces, above suspended ceilings in finished and unfinished rooms, or all other locations not exposed to view.

C. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

D. K Factors: All K Factors shown in the following specifications are expressed in BTU-in/hr-sq.ft-F.

1.7 SUBMITTALS

A. General: Comply with Section 230500.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer's Installation Instructions: Indicate procedures, which ensure acceptable workmanship and installation standards will be achieved.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements Fire Hazard Classification: Insulation shall have a composite (insulation, jacket or facing, and adhesive to secure jacket or facing) fire hazard rating as tested by ASTM E84, NFPA 255, or UL 723 not to exceed 25 flame spread, 50 fuel contribution, and 50 smoke development. Materials shall be labeled accordingly.

B. Certifications of Insulation and Covering Materials: UL listed; flame spread/fuel contributed/smoke development rating of 25/50 in accordance with ASTM E84, NFPA 255, and UL 723.

1.9 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum five years of documented experience.

1.10 DELIVERY, STORAGE AND HANDLING

A. General Requirements: Comply with Section 230500. Deliver materials to job site in original non-broken factory packaging, labeled with manufacturer's density and thickness. Store in a warm, dry location and protect against dirt, water, chemical, and mechanical damage.

1.11 PROJECT CONDITIONS

A. Manufacturer's Requirements: Maintain ambient temperatures and conditions required by manufacturers of adhesive and insulation while in storage.

B. Environmental Requirements: Perform work at ambient and equipment temperatures as recommended by the insulation manufacturer.

C. Protection: Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Repair or replace any such insulation or covering damaged prior to final acceptance of work.

1.12 WARRANTY

A. General: Satisfy requirements of Section 230500.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Owens-Corning Fiberglass Corporation.
   2. Knauf.

3. Certainteed.
4. Manville.

2.2 INSULATION MATERIALS

A. Glass Fiber, Flexible:
1. Insulation: ASTM C-553; flexible, noncombustible blanket.
   a) 'K' value: ASTM C518, of 0.29 at 75 degrees F.
   b) Maximum service temperature: 250 degrees F.
   c) Maximum moisture absorption: 0.20 percent by volume.
   d) Density: 0.75 lb/cu ft.
2. Vapor Barrier Tape:
   a) Kraft paper reinforced with glass fiber yarn and bonded to aluminum film.
3. Tie Wire: Annealed steel, 16 gage.

B. Glass Fiber, Rigid:
1. Insulation: ASTM C612; rigid, noncombustible blanket.
   a) 'K' value: ASTM C518, of 0.29 at 75 degrees F.
   b) Maximum service temperature: 250 degrees F.
   c) Maximum moisture absorption: 0.20 percent by volume.
   d) Density: 0.75 lb/cu ft.
2. Vapor Barrier Jacket:
   a) Kraft paper reinforced with glass fiber yarn and bonded to aluminum film.
   b) Moisture vapor Transmission: ASTM E96; 0.04 perm.
   c) Secure with pressure sensitive tape.
3. Vapor Barrier Tape:
   a) Kraft paper reinforced with glass fiber yarn and bonded to aluminum film, with pressure sensitive rubber based adhesive.

C. Glass Fiber Duct Liner, Flexible
1. Insulation: ASTM C-553; flexible, noncombustible blanket.
   a) 'K' value: ASTM C518, of 0.28 at 75 degrees F.
   b) Maximum service temperature: 250 degrees F.
   c) Density: 2.0 lb/cu ft.
   d) Maximum Velocity on Coated Air Side: 4000 ft/min.
2. Adhesive
   a) Waterproof, fire-retardant type.
3. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

D. Glass Fiber Duct Liner, Rigid:
1. Insulation: ASTM C-612; flexible, noncombustible.
   a) 'K' value: ASTM C518, of 0.23 at 75 degrees F.
   b) Maximum service temperature: 250 degrees F.
   c) Density: 2.0 lb/cu ft.
   d) Maximum Velocity on Coated Air Side: 4000 ft/min.
2. Adhesive:
   a) Waterproof, fire-retardant, type.

3. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

2.3 JACKETS

A. Canvas Jackets: UL listed.
   1. Fabric: 6 oz/sq yd, plain weave cotton treated with dilute fire retardant lagging adhesive.
   2. Lagging Adhesive: Compatible with insulation.

B. Aluminum Jacket: ASTM B209.
   1. Thickness: 0.025-inch sheet.
   2. Finish: Smooth or Corrugated.
   3. Joining: Longitudinal slip joints and 2-inch laps.
   4. Fittings: 0.016-inch thick die shaped fittings covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8-inch wide, 0.016-inch thick aluminum.
   6. Flexible glass fiber with fire resistant coating facing air stream; ASTM E-84/ASTM C518-70; 'k' value of 0.25 maximum at 75 F, 2 lb. density, one-inch thickness.

C. Type C: Neoprene faced, rigid glass fiberboard, 2 lb. density, ASTM E- 84/ASTM C-518; 'k' value of 0.23 at 75 F; one-inch thickness.

D. Jackets:
   1. Interior Applications
      a) Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
   2. Exterior Applications
      a) Sheet metal enclosure of corrugated aluminum, 0.02 in. thick, with metal jacket bands: 3/8 inch wide, 0.016 thick aluminum; or stick clips with smooth finish.

2.4 ACCESSORIES

A. Impale Anchors: Galvanized steel, 12 gage, self-adhesive pad and press on washer head.

B. Joint Tape: Glass fiber cloth, open mesh.

C. Lagging Adhesive: Fire resistive to ASTM E-84 or NFPA 255 or UL 723.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. General

1. Applications: Apply insulation tightly over clean, dry surfaces with sections or edges firmly butted together or lapped. Make insulation continuous through sleeves or openings in walls or floors.
2. Vapor Barriers: Seal vapor barriers and run continuous throughout for heated and cooled supply air ductwork.
3. Finishes: Finish insulation neatly at hangers, supports and other protrusions. Locate insulation or cover seams in least visible locations.
4. Installation Repairs: Repair separation of joints or cracking of insulation due to thermal movement or poor workmanship.
5. Exterior Locations: Re-cover with corrugated aluminum jacket attached with suitable aluminum rivets.
6. Manufacturer's Instructions: Install materials in accordance with manufacturer's instructions.
7. Thermal Units: Provide insulation with vapor barrier on ductwork downstream of fan coil terminal units.
8. Factory Insulated Equipment: Do not insulate factory-insulated equipment.
9. Attachment: Apply insulation as close as possible to equipment by grooving, scoring, and bevelling insulation, if necessary. Secure insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
10. Cement and Fillers: Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.
11. Placards: Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such nameplate or any operable device.
12. Service Access: When equipment with insulation requires periodical opening for maintenance, repair, or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage.
13. Insulation shall be installed in a workmanlike manner by workmen regularly engaged in this type of work. Insulation shall not be applied until all surfaces are clean and dry and until inspection and release for insulation application.
14. A complete moisture and vapor seal shall be provided on cold surfaces where vapor barrier jackets or coatings are required. Anchors, hangers and other projections shall be insulated and vapor sealed to prevent condensation.
15. Duct insulation shall be continuous through walls and floor openings except where walls or floors are required to be fire stopped or required to have a fire resistance ratings.

B. Locations for Insulation:

1. External: Outside of ducts not internally lined, located interior of building, in mechanical room.
    a) Rectangular: 1-1/2-inch thick glass fiber insulation. Fasten to duct with weld pins or stock clips spaced 12 inches to 18 inches o.c. with minimum of two rows per side of duct. Secure with washers firmly embedded in insulation. Seal joints, breaks and punctures in cold air ductwork wire fire-retardant vapor adhesive reinforced with a three-inch wide strip similar to that of facing.

b) Round: Two-inches thick glass fiber blanket duct wrap. Adhere insulation to duct with fire retardant adhesive applied in bands around the duct. Butt tight with facing overlapping all joints at least two inches. Seal cold air ductwork with fire retardant vapor barrier adhesive. Seal breaks and punctures in the facing of cold air ductwork with vapor barrier tape sealed with fire retardant adhesive.

2. For exterior applications, provide insulation with vapor barrier jacket w/2" thick rigid insulation w/minimum R-value of 8. Cover with caulked aluminum jacket with seams located on bottom side of horizontal duct section.
3. Insulation below grade shall be polyurethane spray foam, suitable for use in wet environments without degradation and having the following properties.
   a) All duct shall be supported on 2" thick rigid polystyrene board exceeding the width of the duct. Spray foam shall be applied to assure a 2" MINIMUM coverage. Insulation shall be coated with Deer-O Foam Cap W-256 applied at the rate of one gallon per 100 square ft. for vapor barrier protection with a perm rating of 0.00019.

C. Duct Liner
1. Duct liner shall be installed in accordance with Figures 6-1 through 607 of the SMACNA High Velocity Duct Manual and the Manufacturer's recommendations.

END OF SECTION

SECTION 23 2113

HYDRONIC PIPING SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The Contractor shall furnish and install the Hydronic Piping Systems for heating hot water and chilled water as shown on the drawings including specialties shown or called out in the equipment list and as necessary for satisfactory operation of the system.

1.3 RELATED WORK IN OTHER SECTIONS

220523 - VALVES
220700 - PIPING INSULATION
221000 - PIPE AND PIPE FITTINGS
230000 - HEATING, VENTILATING, AND AIR CONDITIONING INDEX
230500 - GENERAL HEATING, VENTILATING, AND AIR CONDITIONING REQUIREMENTS
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230519 - PIPING SPECIALTIES
230548 - VIBRATION ISOLATION AND EXPANSION COMPENSATION

PART 2 – PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Pipe and pipefittings shall be as described in Section 221000 - PIPE AND PIPE FITTINGS.

2.2 VALVES

A. Valves other than automatic control valves shall be provided as shown or required to protect the system and are specified in Section 220523 - VALVES.

B. Automatic control valves are specified in Section 253000 - CONTROLS AND INSTRUMENTATION.

2.3 COILS

A. Water coils are as specified on the Mechanical Equipment Schedule on the drawings.

B. Water coils shall be provided with a manual air vent located in the system piping, in addition to the one provided with the coil in order to purge any trapped air from the coil and associated piping.

2.4 PUMPS

A. Pumps shall be of the type and capacity listed in the equipment schedule and shall be furnished with open drip proof motors. Pumps shall be selected so that the motors will not overload under any possible operating condition including open discharge. Furnish one spare mechanical seal for each pump. All pumps shall have drain pans with tapped pipe connections and 3/4 inch drain line extended to floor drain. Pumps shall be installed so that they may be removed without the removal of the associated piping. All pump strainers shall be provided with blow off valves and lines full size extended to floor drain.

2.5 EXPANSION TANKS

A. Expansion tanks shall be as scheduled on the drawings. Expansion tanks in antifreeze-protected systems shall be constructed and labeled for service in antifreeze-protected systems.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Piping installation shall conform to the requirements of Section 221000 - PIPE AND PIPE FITTINGS.

B. Installation of specialties shall conform to the requirements of Section 230519 - PIPING SPECIALTIES.

3.2 TESTS

A. All piping shall be proved tight at a hydrostatic pressure of 150 psi and show no loss in pressure for a period of one hour.

END OF SECTION

SECTION 23 2500

WATER TREATMENT SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The Contractor shall provide all labor, material, equipment, design detail and layout required to provide complete water treatment systems indicated in these specifications. The Contractor shall coordinate installation of the water treatment system(s) with the trades involved in constructing other systems. The contractor shall furnish all piping, valves, equipment, meters, probes, tanks, pumps, controls, wiring, etc., for the water treatment system. The water treatment contractor shall coordinate location of required electrical receptacles with electrical contractor and piping instrument taps or wells with the piping contractor and obtain final approval from Architect/Engineer, with any additional cost incurred by this contractor. The Contractor shall not hold the Owner liable for any lack of coordination.

1.3 RELATED WORK IN OTHER SECTIONS

220700 - PIPING INSULATION
221000 - PIPE AND PIPE FITTINGS
230000 - HEATING, VENTILATING, AND AIR CONDITIONING INDEX
230100 – DEMONSTRATION AND TRAINING
230500 - GENERAL HEATING, VENTILATING, AND AIR CONDITIONING REQUIREMENTS
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

1.4 GENERAL

A. All systems and components shall be furnished and installed by one Contractor. The contractor shall have a minimum of five (5) years experience in design and installation of water treatment systems. The Architect/Engineer may reject any proposed installer who cannot show evidence of such qualifications.

B. The system components and information herein are intended to establish standards of performance, quality and construction.

1.5 SUBMITTALS

A. In addition to submittals required under GENERAL PROVISIONS the contractor shall furnish a 1/8" scale (minimum) room floor plan indicating location and connection points of all equipment to be installed.

PART 2 – PRODUCTS

2.1 WATER TREATMENT - SYSTEM(S)

A. Hot Water Boiler:
   1. Provide a boiler water treatment system for the hot water boiler(s) to inject controlled amounts of non-chromate chemicals into the boiler(s) as required to prevent scaling and corrosion of the closed loop system.
   2. The Contractor shall provide all necessary chemicals and service for one year. The Contractor shall provide the Owner with written reports, analysis and recommendations on a monthly basis during the year with weekly reports when the boiler is in operation.
   3. The equipment shall consist of a by-pass feeder similar to Neptune Chemical Pump Company VTF or approved equal. The quantity of the chemical shall be determined by a qualified water treatment chemist for each type of installation.
   4. Provide a ball or gate valve and a check valve at each connection. Connecting tube may be plastic or copper as preferred by the Contractor and approved by Code for the location where installed.
   5. The chemical shall be formulated by a water treatment chemist to prevent scale formation in the boiler and any foaming in the boiler. A oxygen scavenger shall be included.

B. Chilled water systems shall be provided with the same water treatment system as boiler system as boiler system except treatment shall be for chilled water system.

C. Open Cooling Tower:
   1. Provide a open cooling tower water treatment system for the cooling tower(s) shown on the drawings to inject controlled amounts of chemicals into the make-up water system for scale, corrosion and biological control.
   2. The Contractor shall provide all necessary chemicals and service for one year. The Contractor shall provide the owner with written reports, analysis and recommendations on a monthly basis with weekly reports when the cooling tower(s) is in operation.
   3. The equipment shall consist of a tank-mounted, positive displacement metering pump similar to Liquid Metronics A141-155 or approved equal. The chemical tank and cover shall be similar to LIQUID METRONICS, INC. NO 26350 or approved equal. The automatic chemical feed and bleed controller shall be similar to HYDAC Towermatic 125M or approved equal. The conductivity probe shall be HYDAC Flo-Thru Assy. No. 301274 or approved equal. The water meter shall be Arad No. 905570 or approved equal.
   4. Provide a ball or gate valve and a check valve at each connection. Connecting tubing may be plastic or copper as preferred by the Contractor and approved by Code for the location where installed.
   5. Chilled water systems shall be provided with the same water treatment system as boiler system as boiler system except treatment shall be for chilled water system.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install the system(s) completely. After the equipment and piping system have been installed and cleaned thoroughly and are ready to be filled, the treatment contractor shall provide the necessary treatment, for the fill of all piping and related equipment. The contractor shall be present at initial fill of the system(s).

B. After operation of several hours, the treatment level in all systems shall be checked and adjusted to the proper level.

C. After operation for several days, the treatment level of all systems shall be checked and adjusted. Repeat in 30 days.

D. The installer shall be responsible for adjusting the proper amounts of chemicals on a monthly basis for the first year.

E. Instruct the owner in proper methods of testing and adjusting the water treatment equipment and chemicals.

END OF SECTION

SECTION 23 3000

AIR DISTRIBUTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish and install fans, filters, sheet metal work, grilles, louvers, diffusers, registers, sound traps, special fan bases, fire dampers, combination fire and smoke dampers and sleeves, accessories and natural gas fired appliance flue vents.

B. All automatically controlled dampers furnished under Section 253000 - CONTROLS AND INSTRUMENTATION will be installed under this section. After dampers are set they shall be balanced for free and easy operation.

C. Where ductwork has an interior lining, dimensions shown on drawings shall be clear dimensions inside the liner.

D. Prior to system test and balance, supply and install new, clean air filters throughout the air handling systems except for any high efficiency filters, which have pressure drop within normal operating limits.

1.3 REQUIREMENTS AND RELATED WORK

230000 - HEATING, VENTILATING, AND AIR CONDITIONING INDEX
230500 - GENERAL HEATING, VENTILATING AND AIR CONDITIONING REQUIREMENTS
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230593 - BALANCING OF MECHANICAL SYSTEMS
230713 - DUCT INSULATION
253000 - CONTROLS AND INSTRUMENTATION

1.4 REFERENCES

A. ASTM A 36 - Structural Steel

B. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles

C. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

D. ASTM A 366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality

E. ASTM A 480 - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

F. ASTM A 525 - General Requirements for Steel Sheet, Zinc- Coated (Galvanized) by the Hot-Dip Process

G. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality

H. ASTM A 568 - Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled

I. ASTM A 569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality

J. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate

K. AWS D9.1 - Welding of Sheet Metal

L. NFPA 90A - Installation of Air Conditioning and Ventilating Systems - Latest Edition

M. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems -Latest Edition.

N. NFPA 91 - Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying - Latest Edition

O. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment - Latest Edition

P. SMACNA - HVAC Air Duct Leakage Test Manual

Q. SMACNA - HVAC Duct Construction Standards - Metal and Flexible – 1985

R. UL STANDARD 181 - Factory-Made Air Ducts and Connectors

S. UL STANDARD 555 – Standard for Safety Fire Dampers

T. UL STANDARD 555S – Leakage Rated Dampers for use in Smoke Control Systems

PART 2 – PRODUCTS

2.1 EQUIPMENT SCHEDULES

A. All major items of equipment are specified in the equipment schedule on the drawings and shall be furnished complete with all accessories normally supplied with the catalog item listed and all other accessories necessary for a complete and satisfactory operating system.

B. All registers, grilles and diffusers shall be as listed in the schedule on the drawings. Frame style shall be coordinated by the Contractor to match the ceiling type shown on the reflected ceiling plans of the Contract Documents.

2.2 DUCTWORK

A. Sheet Metal

1. Materials and Gauges: Construct all ducts, casings, plenums, etc., of galvanized steel sheets, of the gauges specified below, unless otherwise shown. Sheets shall be free from blisters, slivers, pits and imperfectly galvanized spots.
2. All ductwork shall be constructed in accordance with "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE". First Edition, 1985 as published by Sheet Metal and Air Conditioning Contractors National Association, Inc. Pressure class for all ductwork shall be 2” or unless otherwise noted on plans.
3. Construct low velocity ducts using Pittsburgh or "Snap-Lock" corner seams. All seams shall be made airtight. Using United Mc Grill “UNI-FLEX” duct sealer or approved equal.
4. Connections of high pressure and/or velocity ducts, fittings and high pressure boxes shall be made airtight by tack welding on 8" centers and coating joints with United Mc Grill “United duct Sealer”.
5. Round ducts and fittings for high velocity systems shall be spiral lock seam conduit as manufactured by United Mc Grill Co., Inc., or approved equal. All 90 elbows shall be at least 5-piece construction. Standard manufactured ducts of other than spiral construction will be acceptable if constructed of the following gauges with welded seams. Sizes thru 12-inch diameter shall be 22 gauge, 13 inch thru 36 inch diameter shall be 20 gauge, 37 inches and over shall be 18 gauge. Basic high velocity fittings are detailed on the drawings. Spun or tapered takeoffs shall be used from all vertical high velocity risers.

B. Construct T's, bends, and elbows with radius of not less than 1-1/2 time’s width of duct on centerline. Where not possible and where rectangular elbows are used, provide airfoil-turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible, maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4-inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45-degree lateral wye takeoffs unless otherwise indicated where 90-degree conical tee connections may be used.

F. Flexible

1. Flexible ducts for connections between rigid ductwork and variable volume boxes shall be Factory Insulated flexible conduit capable of holding 5 inches W.C. without development leaks and shall not exceed a flame spread of 25 or a smoke development of 50. Thermo flex Type N-KH or approved equal.
2. Flexible connections between the diffusers and the run out ducts shall be factory insulated, sound absorbing low velocity flexible conduit conforming to the following duct fabrication shall not exceed a flame spread of 25 or a smoke development of 50.

a) Two ply vinyl film supported by helically wound spring steel wire: fiberglass insulation: polyethylene vapor barrier film.
b) Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
c) Maximum Velocity: 4000 fpm (20.3 m/sec).
d) Temperature Range: -10 degrees F to 160 degrees F (-23 degrees C to 71 degrees C).

2.3 COMBINATION FIRE/SMOKE DAMPERS

A. Furnish and install at locations shown on plans, or as required by code combination fire/smoke dampers meeting the following specifications. Frame shall be galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement.

B. Each combination fire smoke damper shall be 1-1/2 hour fire rated under UL Standard 555 or greater where noted on architectural plans, and bear a UL label attesting to same. Damper manufacturer shall have tested, and qualified with UL, a complete range of damper sizes covering all dampers required by this specification. The leakage rating under UL555S shall be Leakage Class II (10 cfm/ft. at 1" w.g.)

C. In addition to the leakage ratings already specified herein, the dampers and their actuators shall be qualified under UL555S to an elevated temperature of 250º F, 350ºF, or 450ºF depending upon the actuator. Appropriate electric "Firestat" operator shall be installed by the damper manufacturer at time of damper fabrication. Damper and actuator shall be supplied as a single entity which meets all applicable UL555 and UL555S qualifications for both dampers and actuators. Manufacturer shall provide factory assembled sleeve of 16" minimum length (contractor to verify requirement). Factory supplied caulked sleeve shall be 16 gage for dampers up to 36" wide by 24" tall and 14 gage above 36" wide X 24" tall.
1. Combination Fire/Smoke dampers shall be Ruskin FSD6O rectangular dampers and Ruskin FSDR25 for round dampers or approved equal with correct mounting frames and sleeves for actual installation.
2. Combination Fire/Smoke dampers for corridors ceiling shall be Ruskin FSD36 with internally mounted actuator.

D. Each combination fire and smoke damper shall include an integral factory furnished and installed duct smoke detector compatible with the building fire alarm system. Assembly by Ruskin DSDN or approved equal.

E. Size of access doors in ductwork shall be 2 inches less than the width of the duct by 12 inches, up to a maximum size of 24 inches by 24 inches.

2.4 FIRE DAMPERS

A. Furnish and install at locations shown on the drawings or as required by code fire dampers meeting the following requirements. Provide access doors at all fire damper locations of sufficient size to allow easy resetting of fire damper linkage. Fire damper links shall be of the test strength recommended to prevent nuisance closing. All fire dampers shall conform to the requirements of NFPA Pamphlet 90A and shall meet the required UL Standard 555.

B. High Velocity Round or Oval Fire Dampers: High velocity fire dampers shall be of the folding blade type designed for minimum static pressure drop. Fusible links shall be accessible from either side of the damper. Each damper shall be furnished complete with a galvanized welded steel sleeve (round or oval) and closure compartment to house the folded blades. Fire dampers shall be Ruskin FD35 with 165°F fusible link or approved equal.

C. Rectangular Fire Dampers: Fire dampers for rectangular ductwork shall be of the folding blade type with the hinged blades completely out of the air stream of the single hinged blade type. Fusible links shall be accessible from either side of the damper. Each damper shall have a galvanized welded steel sleeve (rectangular or square) and closure compartment to house the folded blades. Rectangular fire dampers mounted in the horizontal plane are to be spring loaded. Fire dampers shall be Ruskin DIBD with 165°F fusible link or approved equal.

D. Provide access doors at all fire damper locations of sufficient size to allow easy resetting of fire damper linkage. Size of access doors in ductwork shall be 2 inches less than the width of the duct by 12 inches, up to a maximum size of 24 inches by 24 inches.

E. Each fire damper shall be provided with spare fusible link(s) secured to the damper.

2.5 ACCESS DOORS

A. Wall and Ceiling Access Doors: Furnish as required in Section 230500, paragraph 3.6.

B. Duct Access Doors: Duct access doors at fire dampers and other locations which require access to mechanical devices inside of ductwork shall be Controlair 16 gauge access door with continuous hinge, neoprene gasket, thumb screw locks and baked enamel finish. Doors shall be sized for easy access to mechanical device.

C. Doorframes on insulated ductwork shall be placed on an extended metal collar flush with the face of the finished insulation.

D. Latches shall be operable from either side of door and shall be "Ventlok" No. 310.

2.6 FILTERS

A. Filters shall be as listed in the schedule on the drawings.

B. Filter gauge for each bank of filters in the mechanical rooms and roof top equipment will be supplied and installed by the Controls Contractor as specified in Section 253000 - CONTROLS AND INSTRUMENTATION.

2.7 COILS

A. In no case shall specified air or water pressure drops be exceeded more than 10%. Piping connections shall be as shown on the drawings. Coils shall be as specified in the equipment schedule on the drawings. In no case shall rows or fin spacing be less than the minimum surface scheduled.

2.8 TURNING VANES

A. Turning vanes shall be installed in all square elbows. Turning Vanes shall be air foil blade type, shop or factory fabricated.

2.9 FLUE GAS VENTS

A. Gas fired equipment shall be vented in accordance with the Uniform Mechanical Code, Uniform Plumbing Code and local codes and ordinances. Natural draft appliances shall have Type "B" vents.

PART 3 – EXECUTION

3.1 INSTALLATION OF SHEET METAL WORK

A. All necessary allowance and provisions shall be made in the installation of sheet metal ducts for the structural conditions of the building, and ducts shall be transformed or divided as may be required. Whenever this is necessary the required area shall be maintained. All of these changes, however, must be approved and installed as directed at the project. During the installation, the open ends of ducts shall be protected to prevent debris and dirt from entering. Whenever exposed ducts pass through walls, floors or ceilings, a flanged sheet metal collar fitting close around ducts shall be slipped along duct until flange is tight against finished surface covering edges of openings and presenting a neat appearance. Collar shall be locked to duct.

B. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

C. Use double nuts and lock washers on threaded rod supports.

D. Connect diffusers or light troffer boots to low-pressure ducts with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.

E. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

F. Encase buried metal ductwork in 3-inch minimum of concrete. Provide adequate tie-down points to prevent ducts from floating during concrete placement. Introduce no heat into ducts for 20 days following placement of concrete.

G. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

H. All ducts, coils, housings, registers, grilles, fans, etc., shall be clean when installed and shall be kept clean until the system is completed. As the various parts of the system are installed they shall be wiped or blown clean and openings taped dust-tight with heavy paper or cardboard until the system is completed and ready for testing. At that time all covers and protective wrappings shall be removed. Where one has been torn or previously removed, the duct, coil, register, etc., shall be carefully cleaned of any dirt or dust that has entered the opening.

3.2 DUCTS AT MASONRY

A. Where ducts are shown connecting to masonry openings and along edges of all plenums at floors and walls, provide a continuous 2" x 2" x 1/8" galvanized angle iron which shall be bolted to the construction and made airtight to the same by applying caulking compound. Sheet metal in these locations shall be bolted to the angle iron.

3.3 HAND AND SPLITTER DAMPERS

A. Install hand operated volume and splitter dampers at all locations of branches of main ducts, from equipment, supply ducts, return ducts and at all locations where air flow splits or is balanced, whether shown or not. Volume dampers shall be controlled by heavy duty locking quadrants mounted on the outside of the duct. Where ducts are insulated the damper rod shall be extended and the operator shall be mounted on the outside of the insulation. Where volume dampers are installed in ducts over 12" deep, the dampers shall be made in two sections and each independently operated. Splitter dampers shall be at least 1 1/2 times as long as the narrowest adjacent split. All damper fittings must be heavy commercial items and must be approved by the Architect/Engineer before installation.

3.4 FLEXIBLE CONNECTIONS

A. Provide glass fabric, neoprene coated flexible connections, not less than 6" wide at the inlet and outlet connection of each fan unit, securely fastened to the unit and to the ductwork. Material shall comply with Underwriter's Laboratories Standard 214.

B. Indoor applications shall have Metaledge Ventglas with heavy glass fabric, double coated with Dupont's Neoprene.

C. Outdoor applications shall have Metaledge Ventlon with heavy glass fabric, double coated with Dupont's Hypalon.

3.5 CROSS BREAKING

A. Rectangular sheet metal ducts shall be cross-broken on the four sides of each 4-foot panel. All vertical and horizontal sheet metal barriers, duct offsets, elbows, as well as 4-foot panels of straight sections of ducts shall be cross-broken. Cross breaking shall be applied to the sheet metal between the standing seams or reinforcing angles. The center of the cross break shall be of the required height to assure surfaces being rigid. High velocity plenum panels and ductwork shall not be cross-broken.

3.6 TEST HOLES IN DUCTWORK

A. Furnish test holes in ducts at locations required by the testing and balancing team for testing of air quantities in ducts. Ventlok No. 699, closures shall be provided and installed for each test hole, with sufficient neck length to penetrate the insulation.

3.7 HANGERS AND SUPPORTS

A. Hangers for ducts up to 18 inches in width or diameter shall be placed not more than ten-foot centers. Ducts 19 inches and over in width or diameter shall be supported on not

more than five foot centers. Hangers shall be placed plumb and present for a neat appearance. Construct hangers for high velocity boxes and for ductwork form galvanized iron 1" x 1" x 1/16" for ducts up to 36 inches in width or diameter. For ducts over 36 inches in width or diameter, support ducts every 4'-0" with 1 1/4" x 1 1/2" x 1/8" angles. The use of perforated band iron for duct support is prohibited. Hangers shall extend down the sides of the ducts using not less than three rivets or parker screws of appropriate sizes. It is essential that all ducts be rigidly supported. Where vertical ducts pass thru floors or roofs heavy supporting angles shall be attached to ducts and to the structure. Angles shall be of sufficient size to support ductwork rigidly. Place supporting angles on at least two sides of the duct.

3.8 FABRICATION

A. All ductwork shall be fabricated with the mill markings on the outside.

3.9 TESTS

A. Testing and balancing of the air tempering systems will be as specified in Section 230593 - BALANCING OF MECHANICAL SYSTEMS.

B. If specified conditions cannot be obtained due to deficiencies in equipment performance or improper installation or workmanship, the Mechanical Contractor shall make any changes necessary to provide the specified conditions.

C. Cleaning ducts and testing for tightness: Before the ceiling is installed and final connections are made to air outlet devices, operate the fans at full capacity to blow out dirt and debris from the ducts. If it is not practical to use the main supply blower for cleaning, the ducts may be blown out in sections by a portable fan. After the ducts have been cleaned, an air tightness test shall be made on all ductwork. A minimum pressure equal to fan static pressure at less than 10% of design flow or 2 1/2 times design external static pressure, whichever is less shall be maintained during the test. A soap test shall be applied to all sheet metal connections and joints to locate air leaks. Air leaks which are in excess of that required to bubble the soap suds (that is, actually blow the suds away), shall be sealed by additional taping and caulking to reduce the leakage to a rate not to exceed slow bubbles forming. In lieu of the above tightness tests, the Contractor may test the ducts by attaching a fan with a capacity of not over 300 cfm at 2 1/2" static pressure to the ductwork and with outlets blocked airtight, build up the pressure in the ducts to 2" water gauge. If this pressure cannot be obtained the Contractor shall locate and repair the leaks as specified above. The Architect/Engineer and Owner's Representative shall witness the test and the Contractor shall notify the Insulation Contractor in writing when the test has been satisfactorily completed.

END OF SECTION

SECTION 25 0000

INTEGRATED AUTOMATION INDEX

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish all service tools, equipment, etc., which are required for the complete installation of all Integrated Automation Work, as indicated on the Drawings and specified herein. Integrated Automation work indicated on the Drawings and/or specifications covering other trades shall conform to Division 25 of these Specifications.

B. Work or equipment not indicated or specified, which is necessary for the complete and proper operation of the Integrated Automation systems shall be accomplished without additional cost to the Owner.

C. Furnish all labor and materials required for Integrated Automation service connections to all the various items of equipment requiring controls service throughout the project shown on the Contract Drawings (even if not shown on Integrated Automation Drawings). Coordinate with other trades for the installation of required connections and service.

1.3 INTEGRATED AUTOMATION DIVISION INDEX

250500	GENERAL INTEGRATED AUTOMATION REQUIREMENTS
251000	DIRECT DIGITAL CONTROL (DDC) SOFTWARE AND COMPONENTS
251100	ELECTRICAL CONTROLS AND INTERLOCKS
253000	CONTROLS AND INSTRUMENTATION
256000	MECHANICAL AND ELECTRICAL COORDINATION SCHEDULE

PART 2 – PRODUCTS

PART 3 – EXECUTION

END OF SECTION

SECTION 25 0500

GENERAL INTEGRATED AUTOMATION REQUIREMENTS

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes: General Mechanical Requirements specifically applicable to Division 25 sections in addition to Division 1- General Requirements.

B. Scope:

1. The work covered by this division consists of performing all operations in connection with the installation of heating, cooling, ventilating, and plumbing including site utility work as indicated under this section. This entire section applies to all mechanical work and all mechanical sections of these specifications. This Contractor shall read and comply with all sections of these specifications including all General and Special Conditions.

1.2 REFERENCES

A. Standard Requirements:

1. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. All work shall be executed in accordance with the local and state codes, ordinances, and regulations governing the particular class of work involved. This Contractor shall be responsible for the final execution of the work under this heading to suit these requirements. In the event of a conflict between the various codes and standards, the more stringent shall govern. Where these specifications and accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Architect/Engineer. The Architect/Engineer shall prepare any supplementary drawings required, illustrating how the work may be installed so as to comply. On approval of the change by the Architect/Engineer, the Contractor shall install the work in a satisfactory manner without additional cost to the Owner. On completion of the various parts of the work, the installation shall be tested by the constituted authorities and approved, and on completion of the work, this Contractor shall obtain and deliver to the Owner final certificates of acceptance. This Contractor shall furnish copies of each certificate to the Architect/Engineer.

C. The Contractor shall secure all permits and licenses for his work and shall pay all fees in connection with such permits and licenses.

D. The contractor shall hold and save the Owner free and harmless from liability of any nature or kind arising from his failure to comply with codes and ordinances.

E. Any and all meter deposits and all utility extension costs shall be paid by the Contractor whose work is done in connection with the service that the meter is connected to.

F. Schedule of Referenced Organizations: The following is a list of the acronyms of organizations referenced in these Specifications:

1.	AABC	Associated Air Balance Council
2.	ADC	Air Diffusion Council 435 North Michigan Ave. Chicago, IL 60611
3.	AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004
4.	ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
5.	ASHRAE	American Society of Heating Refrigerating and Air Conditioning Engineers 345 East 47th Street New York, NY 10017
6.	ASME	American Society of Mechanical Engineers 345 East 45th Street New York, NY 10017
7.	ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
8.	FM	Factory Mutual System 1151 Boston-Providence Turnpike Norwood, MA 02062
9.	FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Building 197 Washington, DC 20407
10.	NBFU	National Board of Fire Underwriters 5530 Wisconsin Avenue, Suite 750 Chevy Chase, Maryland 20815
11.	NEC	National Electric Code (of NFPA)
12.	NEBB	National Environmental Balancing Bureau 8224 Old Courthouse Road Vienna, VA 22180
13.	NEMA	National Electrical Manufacturer's Association 2101 L Street, NW Washington, DC 20037
14.	NSF	National Sanitation Foundation Box 1468 Ann Arbor, MI 48106
15.	OSHA	Occupational Safety and Health Administration U.S. Department of Labor
16.	SMACNA	Sheet Metal and Air Conditioning Contractor's National Association 8224 Old Courthouse Road Vienna, VA 22180
17.	TIMA	Thermal Insulation Manufacturers Association

Technical Services
1420 King Street
Alexandria, VA 22314

18. UL Underwriters Laboratories, Inc.
333 Pfingston Road
Northbrook, IL 60062

G. Underwriters Laboratories Inc. (UL): All materials, appliances, equipment, devices or appurtenances shall conform to the applicable standards of Underwriters Laboratories Inc., where such standards have been established.

1.3 DRAWINGS

A. Drawings and specifications shall be considered as cooperative, and work or materials called for by one and not mentioned in the other, or vice versa, shall be done and furnished as though treated by both.

B. In the cases of discrepancies in figures, drawings, or specifications, the Architect/Engineer shall be notified immediately and his decision shall determine the necessary adjustment. Without such decision, said discrepancies shall not be adjusted by the Contractor save only at his expense, and, in case of any settlement or any complication arising from such adjustment to the Contractor, he shall bear all extra expense involved.

C. Should it appear that the work intended to be done, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings or specifications, the Contractor shall apply to the Architect/Engineer for such further drawings or explanations as may be necessary, allowing a reasonable time for the Architect/Engineer to supply same, and the Contractor shall conform to same as part of the Contract.

D. Should any doubt or question arise in respect to the true meaning of the drawings or specifications, reference shall be made to the Architect\Engineer whose decision shall be final and conclusive. No alleged oral admission, condonation, or inadvertent neglect on the part of the Architect/Engineer will be accepted as an excuse for inferior work.

E. The mechanical plans do not give exact details as to elevations of ductwork and piping, exact locations, etc., and do not show all offsets, control lines, pilot lines, and other installation details. The Contractor shall carefully lay out his work at the site to conform to the structural conditions, provide proper grading of lines, to avoid all obstructions, to conform to details of installation supplied by the manufacturer of the equipment to be installed, and thereby to provide an integrated, satisfactory operational installation.

F. Should the particular equipment which any Bidder proposes to install, require other space conditions than those indicated on the drawings, the Bidder shall arrange for such space with the Architect/Engineer before submitting his bid. Should changes become necessary on account of failure to comply with these details, the Contractor shall make such necessary changes at his (the Contractor's own expense).

G. The Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans which shall be checked by

the Architect/Engineer and approved before the work is started, Contractor before work proceeds. Interference with structural conditions shall be corrected by the Contractor.

H. All equipment shall be installed in accordance with the manufacturer's recommendations. Provide all accessories and components for optimum operation as recommended by the manufacturer.

1.4 SYSTEM DESCRIPTIONS

A. Not Used.

1.5 PRIOR APPROVALS

A. Each equipment item for which the Contractor desires to install equipment other than the specific item identified in the equipment schedule or equivalent equipment by manufacturers specifically named in the schedule, the Contractor shall bear full responsibility to prove to the Engineer that the furnished equipment is equivalent to or better than the specified item. Failure to provide such proof will result in rejection of the shop drawing submittal by the Engineer. Prior written or verbal approval by the Engineer of equipment by other manufacturers will not relieve the Contractor of responsibility to provide equivalence. Prior approval is required, however, any prior approval given is intended only to provide preliminary agreement that the alternate manufacturer may make equipment that complies with the specification requirements and not that all equipment manufactured by him is acceptable.

1.6 SHOP DRAWINGS

A. Shop drawings or fully descriptive catalog data shall be submitted by the Contractor for all items of material and equipment furnished and installed under this Contract. This shall include piping, ductwork, mechanical equipment, plumbing equipment, control items, etc. The Contractor shall submit to the Architect/Engineer a sufficient number of copies of all such shop drawings or catalog data to provide him with as many review copies as he may need, plus three (3) copies for retention by the Architect/Engineer. No materials or equipment shall be installed until officially approved by the Architect/Engineer.

B. Before submitting Shop Drawings to the Architect/Engineer for review, the Contractor shall examine them and satisfy himself that they are correctly representative of the material or equipment to which they pertain. The Contractor shall so note these Drawings before submitting them. The Contractor's review of Shop Drawings is not intended to take the place in any way of the official review of the Architect/Engineer, and the Shop Drawings which have not been reviewed by the Architect/Engineer shall not be used in fabrication or installing any work.

C. The review of Shop Drawings or catalog data by the Architect/Engineer shall not relieve the Contractor from responsibility for deviations from the plans and Specifications unless he has, in writing, specifically called attention to such deviations as the time of submission and has obtained the permission of the Architect/Engineer thereon, nor shall it relieve him from the responsibility for error of any kind in Shop Drawings. When the Contractor does call such deviations to the attention of the Architect/Engineer, he shall

state in his letter whether or not such deviations involve any extra cost. If this is not mentioned, it will be assumed that no extra costs is involved for making the change.

D. After receiving approval on the make and type of materials, the Contractor shall order such materials in sufficient time so that no delay or changes will be caused. This is done to facilitate progress on the job and failure on the part of the Contractor shall render him liable to stand the expense of any and all delays occasioned by failure on this part to provide necessary details. All shop drawings shall be delivered to the Architect/Engineer's office within thirty (30) days from the date of the contract.

E. Shop drawings will be returned unchecked unless the following information is included: reference to all pertinent data in the Specifications or on the drawings, size and characteristics of the equipment, name of the project and a space large enough to accept an approval stamp. The data submitted shall reflect the actual equipment performance under the specified conditions and shall not be a copy of the scheduled data on the drawings.

1.7 SUBMITTALS

A. Submittal data shall be organized in commercial quality, three ring binders with durable and cleanable covers. Product information for each piece of equipment shall be separated by an indexing leaf with clear tabs. The product name and symbol (i.e. AHU/Air Handling Unit) shall be typed on white paper inserts and placed in appropriate tab. Complete data must be furnished showing performance, quality and dimensions. A signed review by the Architect/Engineer must be obtained before purchasing any equipment.

B. The following items shall be submitted for review by the Architect/Engineer but are not limited to:
   1. Temperature Controls
   2. Vibration Equipment and Calculations

1.8 QUALITY ASSURANCE

A. General: Comply with Division 1.

B. Welder Qualifications: Welders shall be certified by the American Society of Mechanical Engineers (ASME) National Certified Pipe for the type of work being performed. Current operators' certificates in accordance with ASME standards shall be on file at the site and shall be available to the Architect/Engineer for examination. Coupons shall be available for review by the Architect and Engineer.

C. Locations of all pipes, ducts, outlets, appliance, etc., as shown on the drawings, are approximate only and are understood to be subject to such revisions as may prove necessary or desirable at the time the work is installed. Each Contractor will be required to install his work with relation to existing building conditions and shall be entirely responsible for the correctness of his work with reference to finished elevations, etc. Piping shown on the drawings is diagrammatic only and their exact locations, depths, and invert elevations shall be as required for proper flow and coordination with other trades.

D. The contract drawing depicts graphically the arrangement of piping and ductwork. Should local conditions necessitate a rearrangement, or if any of the piping or ductwork can be installed to better advantage in a different manner, the Contractor shall, before proceeding with the work, prepare and submit three (3) copies of Drawings of the proposed arrangement for the Architect/Engineer's review.

E. If the Contractor proposes to install equipment, including piping and ductwork, requiring space conditions other than those shown, or to rearrange the equipment, he shall assume full responsibility for the rearrangement of the space and shall have the Architect/Engineer review the change before proceeding with the work. The request for such change shall be accompanied by Shop Drawings of the space in question.

F. Each Contractor is responsible for the proper location and size of all slots, holes, or openings in the building structure pertaining to his work, and for the correct location of pipe sleeves.

G. Each Contractor shall coordinate his work with that of all other trades that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipelines which require a stated grade for proper operation. Drainage lines shall take precedence over water lines in determination of elevations. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical conduit and ductwork.

H. All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Lubricate all equipment properly in accordance with manufacturer's instructions. Furnish zerk grease fittings on all greaseable bearings.

I. Equipment and Materials: The materials and equipment shall be new and shall be the standard products of the manufacturers regularly engaged in the production of Plumbing, Heating, Cooling, Ventilation, and Fire Protection Equipment, and shall be the manufacturer's latest standard design. Where two or more units of the same class of equipment are required, these units shall be the products of the same manufacturer. However, the component parts of the systems need not be the products of the same manufacturer. Specific equipment specified hereinafter is to be considered a standard of quality and operation. In general, all capacities of equipment, and motor and starter characteristics are shown in schedules on the drawings. Reference shall be made to the schedules for specific information. The capacities shown are minimum capacities. Variations in the characteristics will be permitted only on written approval of the Architect/Engineer. All equipment shall be shipped to the job with not less than a prime coat of paint or as specified hereinafter. Insofar as is possible all items of the same type (i.e., pumps, fans, etc.) shall be by the same manufacturer. Where installation instructions are not included in these specifications or on the plans, the manufacturer's instructions shall be followed. All equipment affected by altitude shall be rated to operate at the altitude where it is to be installed.

J. Excavation and Backfilling: This Contractor shall do all necessary excavation and backfill for the installation of the Mechanical systems as may be required. Curb cuts, asphalt and concrete patching, cutting and patching existing floor, etc., shall be part of this Contractor's responsibility. No extra payment will be made for rock excavation. Trenches for all underground piping shall be excavated to the required depths. The bottoms of trenches shall be tamped hard and graded to secure maximum fall. Bell holes

shall be excavated to assure the pipe resting for its entire length on solid ground. Should rock be encountered, it shall be excavated to a depth of 6 inches below the bottom of the pipe, and before laying the pipe, the space between the bottom of the pipe and the rock surface shall be filled with gravel, thoroughly tamped. Pipe laid in trenches dug in fill shall be supported down in the trenches and shall be filled. No roots, rocks or foreign materials of any description shall be used in backfilling the trenches. The backfill material shall be identical to the surrounding fill material and shall be placed in 6-inch layer, wetted, and compacted to the density of the adjacent soil. See Division 2 for additional information for site utilities. All surplus materials shall be hauled from the project by the Contractor at his expense.

K. Cutting and Repairing:
1. Responsibility of the Contractor whose work is involved. Coordinate with others to prevent unnecessary cutting and repairing.
2. Lay out and locate equipment, openings, and chases. Install sleeves, inserts, and supports. Arrange with those whose work is involved to do cutting and replacing caused by negligence or error with costs reimbursed by the Contractor at fault. Cutting and replacing of existing work shall be the responsibility of the Contractor whose work is being installed.
3. Removal or terminating connections of existing work which is abandoned or replaced shall also be done hereunder to provide correct and finished work.

L. Foundations: All equipment shall be provided with suitable foundations and supports. It shall be the responsibility of the Contractor to provide for the proper locations of these foundations and supports. This applies to all rooftop equipment also.
1. All concrete foundations required by equipment furnished by the Mechanical Contractor shall be constructed by them (except where otherwise noted) the conformity with the recommendations of the manufacturer of the respective equipment, and with the approval of the Architect/Engineer. All corners of the foundations shall be neatly chamfered. Foundation bolts shall be placed in the forms when the concrete is poured. Allow 1 inch below the equipment base for alignment, leveling and grouting with nonshrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary. After removal of the forms, the surface of the foundation shall be rubbed.
2. Unless otherwise noted, foundations shall be a minimum of 6-inch high. All concrete work performed by these Contractors shall conform entirely to the requirements of the Concrete Specifications which describe this class of work.

M. Code Requirements: Comply with state and local code requirements and ordinances. Call for inspections required by responsible building inspection authority.

N. Applicable Building Codes and Ordinances: Including the latest edition of each code, but not limited to the following:
1. International Building Code.
2. Uniform Mechanical Code.
3. Uniform Plumbing Code.
4. Governing Fire Department Requirements
5. Utility Company Requirements
6. National Fire Protection Association Standards

7. NFPA 70 - National Electrical Code
8. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
9. NEPA 90B - Installation of Warm Air Heating and Air Conditioning Systems
10. NFPA 13 - Sprinkler Systems
11. NFPA 101 - Life Safety
12. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment

O. Access Panels

1. Similar to Milcor, or as noted on the drawings, size as required for concealed expansion joints, valving, gauges, balancing dampers, valves, traps, pitot stations, equipment and similar items requiring accessibility. Notify the General Contractor of each access panel location and the required size. Panels shall be proper type for ceiling or wall in which they are installed. The panels shall be furnished under this section of the Specifications, unless otherwise directed, but shall be coordinated to be compatible with walls and ceilings furnished under other sections.

1.9 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1.

B. Large Items: Make arrangements with other trades on the job for introduction into the building of equipment too large to pass through finished openings.

C. Acceptance: Check and sign for materials to be furnished by others for installation under all Mechanical Divisions upon delivery. Contractor shall be responsible for the storage and safekeeping of such materials from time of delivery until final acceptance.

D. Protection: Close ends of pipe and ductwork at the close of each working day during construction to prevent entry of foreign material. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Protect fixtures and equipment against damage during mechanical work with heavy paper or plastic until final clean-up.

E. Storage: Store equipment in covered enclosure or wrap with weather tight 6 mil Visqeen.

F. Shipping Protection: Protective casings, crating, and coverings to remain in place until start-up of equipment.

1.10 PROJECT CONDITIONS

A. Performance: All systems are to be rated at [5,500 ft.] elevation.

1.11 SEQUENCING AND SCHEDULING

A. General: Comply with Division 1.

B. Schedule: Coordinate and order the progress of mechanical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.

C. Utility Interruptions: Schedule mechanical utility interruptions with the Architect/Engineer/Owner minimum of seven (7) days prior to the requested outage. Plan work so that duration of the interruptions a maximum of one day.

1.12 CONTROLS WIRING AND ELECTRICAL EQUIPMENT

A. All mechanical equipment controls wiring, conduit, relays, interlocks, and all accessories required for a completely operational controls system shall be the complete responsibility of the mechanical contractor. The mechanical contractor has the option to hire the project electrical contractor or any qualified controls contractor to install mechanical controls wiring and conduit. Refer to specification 251000 for installation requirements. Refer to Specification Section 253000 for coordination requirements between mechanical, electrical, and controls subcontractors.

B. Electrical items such as disconnect switches and motor starters associated with equipment provided by Division 25, when specifically mentioned to be furnished by the Mechanical Contractor, whether in these specifications or on the Electrical or Mechanical Drawings, shall be furnished by the Contractor. These items shall be mounted and connected as required for a completely operational system. See Control Systems Specification for further information.

C. All electrical equipment characteristics (voltage, etc.) must be verified by the Contractor prior to ordering. If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Architect/Engineer of the change and shall then coordinate the change with the Electrical Contractor and shall pay all additional charges in connection with the change.

1.13 PROTECTION AGAINST HAZARDOUS CONDITIONS

A. The Contractor shall take precautions against hazardous construction conditions at all times during construction. The final condition of the facilities shall be safe, and where safety to operating personnel is jeopardized, suitable signage shall be posted.

B. Protruding metal (bolts, steel angles, etc.) potentially hazardous to maintenance and operating personnel, shall be cut back and/or protected to reduce the risk of injury. All openings between floors shall be protected with barriers around the openings, gratings across the openings, or steel bars through the openings to avoid and protect against injury.

1.14 HAZARDOUS SIGNS

A. Equipment room contains moving or rotating parts, floor openings, or other potentially hazardous environments and shall include a sign on the door entering it that shall read similar to the following: **Hazardous Area - Authorized Personnel Only.**

1.15 OPERATING AND MAINTENANCE INSTRUCTIONS

A. The Mechanical Contractor shall furnish to the Owner a bound manual in triplicate, containing complete repair parts lists, and operating, service, and maintenance instructions on all mechanical equipment, fixtures, and systems.

B. The Mechanical Contractor shall also provide training as required by Section 230100 to the Owner's operation and maintenance personnel.

1.16 OPERATION PRIOR TO ACCEPTANCE

A. The Owner shall have the right to operate any and all apparatus as soon as and as long as it is in operating condition, after Owner personnel have received operational training, whether or not such apparatus has been accepted as complete and satisfactory, except that this shall not be construed to mean operations before any required alterations or repairs have been made. This operation does not indicate acceptance of the equipment by the Owner. When the Contractor enters into a contract with the Owner, he agrees to the above.

1.17 WARRANTY AND SERVICE PROGRAM

A. Due to the critical performance requirements and to clearly establish warranty responsibility for this project, the Contractor shall provide a full service maintenance and warranty program to the Owner for one full year after beneficial occupancy (substantial completion).

B. This service program shall be included as part of the base bid and shall include service, maintenance, repair, replacement, lubrication, temperature control calibration and repairs, and documenting proof for all service and maintenance work on all equipment and system furnished by the Contractor.

C. A single representative in the employment of the Contractor shall be responsible for coordination and follow through of this program. This representative's name and phone number shall be submitted to the Owner as part of the maintenance manuals and supportive data. The Contractor shall respond to a request for service with 24 hours if so requested.

D. During this first year of operation, the following sequence of maintenance service shall be performed as a minimum.
   1. Clean strainers in piping.
   2. Fans and/or pumps be lubricated and oiled once every four (4) months.
   3. Controls shall be calibrated throughout the facility at the end of six (6) months (following substantial completion). Any leaks in the piping systems shall be repaired.
   4. All equipment manufacturer's service recommendations shall be followed during this period.

1.18 FLUSHING AND DRAINING

A. It shall be the responsibility of this Contractor to properly drain and flush all ducts and pipes before use or acceptance to ensure that all debris is completely removed. Damage caused by such debris remaining in the ducts or pipes shall be repaired by this Contractor at his expense. This Contractor shall demonstrate to the Architect/Engineer's representative that all piping is clean.

1.19 CLEANING

A. This Contractor shall remove from the building construction site all rubbish and dirt as it accumulates under the contract. At completion, all areas shall be broom cleaned and all obstructions, surplus materials, etc., removed.

1.20 GUARANTEE

A. The Contractor shall guarantee all materials, equipment, and workmanship furnished and installed by him under this Contract, to be free from all defects of workmanship and materials, and shall agree to replace at his expense, without expense to the Owner, at any time within one year after installation is accepted by the Architect/Engineer, any and all defective equipment, parts, etc., that may be found. (This excludes normal maintenance and daily servicing of equipment which is the Owner's responsibility.)

1.21 FLOOR, WALL, AND CEILING PLATES

A. Where exposed pipes pass through floors, finished walls, or finished ceiling, they shall be fitted with chromium-plated escutcheons of an approved pattern. Escutcheons and plates in Mechanical Rooms do not require chrome finish.

B. This Contractor shall be responsible for providing and installing all counter flashing. All openings in the roof shall be flashed and counterflashed. Use four pound lead flashing materials for all vent lines and welded flashing in steel lines passing through roof. The Mechanical Contractor shall notify the General Contractor where each roof penetrations are and the size of the opening.

1.22 PIPE SLEEVES

A. Schedule 40 steel pipe sleeves or pipe sleeves made of No. 20 gauge galvanized steel, properly secured in place with approximately 1/4" space between each sleeve and the surface of the pipe and/or insulation passing through it, shall be provided for all pipes passing through concrete floors, roofs, and masonry walls. All pipe sleeves shall be fixed in place as the walls and floors are built up. The Contractor shall furnish and locate all sleeves and pipes passing through concrete floors, exterior masonry walls, and roofs shall be made watertight with approved non-hardening plastic material. Sleeves through pipe chase or equipment room floors shall project a minimum of 2-inch above the floor and shall be of black steel pipe with waterproof flange at center of floor thickness. Each sleeve through a fireproof wall shall be packed with approved fireproof rope in the annular space.

1.23 PIPE HANGERS

A. Pipe hangers shall be Fee and Mason of a type suitable for each use. Perforated straps shall not be used in any work. For ferrous pipes up to and including 4 inch in size, use Fee and Mason Fig. 199 malleable iron, adjustable, split ring, swivel hanger. For plumbing piping larger than 4 inch, use Fee and Mason Fig 239 steel clevis hanger. Where several pipes are parallel at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where indicated on the Drawings. For copper pipes up to and including 3 inch in size, use Fee and Mason

Fig. 360 malleable iron, copper plated hangers. For copper pipes larger than 3 inch, use Fee and Mason Fig. 364 copper plated clevis hanger.

B. Hanger rod sizes shall conform to the following schedule:

1.	Pipe up to and including 2"	3/8" rods
2.	Pipe 2-1/2", 3" and 3-1/2"	1/2" rods
3.	Pipe 4" and 5"	5/8" rods

C. Unless shown otherwise on the Plans, all horizontal runs of ferrous piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following spacing:

1.	Pipe up to and including 1-1/4"	8'
2.	Pipe 1-1/2" and 2"	10'
3.	Pipe 2-1/2" and 3"	12'
4.	Pipe 3 1/2” and 4”	14’

D. Unless shown otherwise on the Plans, all horizontal runs of copper piping shall be suspended from the floor or roof construction as the case may be, by means of hangers with the following maximum spacing:

1.	Pipe up to 3/4" in size	5'
2.	Pipe 1" and 1-1/4"	6'
3.	Pipe 1-1/2" and larger	10'

E. There shall be a hanger within 2 inch of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Cast iron pipe shall have not less than one hanger per length of pipe. Vertical risers shall be supported by approved riser clamps at each floor. Vertical pipes within a space shall have not less than two supports.

F. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting, nor shall it be supported from equipment connection.

G. Expansion bolts shall be Ackerman-Johnson or Hilti.

H. Beam clamps suitable for use with this type of steel construction involved shall be Grinnell.

1.24 PRESSURE VESSEL CERTIFICATION

A. Not used.

1.25 ISOLATION

A. Excessive vibration or objectionable noise created in any part of the building by the operation of any equipment furnished and/or installed under the Mechanical Contract will be extremely objectionable and the Contractor shall take all precautions against the same by isolating the various items of equipment from the building structure and by such other means as may be necessary to eliminate all excessive vibration and objectionable noise produced by any equipment installed by them, and consequently, they shall design all

foundations, supports, etc., for their equipment, and all piping with this end in view. In addition, these Contractors shall supervise the construction of all foundations and supports, whether they build them or not, in order that they may be constructed in such a manner as to prevent the transmission of objectionable noise and/or excessive vibration. Submit calculations on all vibration isolation equipment.

B. All equipment having moving parts shall be isolated from the building structure by means of Korfund isolation materials, unless specifically noted otherwise. All isolators shall be the same brand and shall be supplied from the same source. Equipment manufacturer's recommendations shall be followed in the isolation of equipment.

C. Vibration isolators shall have sufficient resilience to meet the following minimum efficiencies:

Motor HP	Equipment Room
Up to 5	90%
7-1/2 to 15	93%
20 to 40	95%
50 to 100	97.5%

D. Spring isolators shall be of the housed type with ribbed pads bonded to the underside of the baseplate or may be unhoused stable springs. Isolators shall be furnished with snubbers and limit stops where so recommended by the equipment manufacturer.

E. The Supplier of the isolating equipment shall, upon completion of the job, check all isolating materials and verify that they are installed properly, and submit a report in writing to the Architect/Engineer.

1.26 TESTING

A. Before completion of this project, the Mechanical Contractor shall test all materials and equipment which normally require testing. All piping, etc., shall be tested to meet code requirements or the Specification requirements, whichever is more stringent.

B. All equipment shall be operated sufficiently long enough to prove to the Architect/Engineer that the equipment performs satisfactorily and meets the requirements set forth on the Plans or in these Specifications.

1.27 CERTIFICATIONS

A. Before receiving final payment, the contractor shall verify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications. Submit certifications and acceptable certificates to the Architect/Engineer.

1.28 GENERAL PIPING INSTALLATION REQUIREMENTS

A. Provisions for Drainage: All piping systems shall be installed so that they may be easily drained. Drain caps, plugs, or hose bibbs shall be installed at low points. Grade piping toward drain locations.

B. Alignment: All installed pipelines shall be straight and shall remain straight against strains. Proper allowance shall be made for expansion and contraction.

C. Clean as Installed: All piping shall be kept free from scale or loose dirt when installed and must be kept clean during the completion of the installation. All openings in the piping system shall be capped or plugged while awaiting further connections. All detergents, solvents and other cleaning agents shall be compatible with the materials of fabrication of the system in which they are used. They shall not adversely affect the materials of mechanisms in the systems and they shall be acceptable to equipment manufacturers. All detergents, solvents, and other cleaning agents shall also be compatible with the process streams to be handled by the systems in which they are used.

D. Insulated Fittings: Install between any dissimilar metals such as steel and copper.

E. Expansion and Contraction: The Contractor shall make all necessary provisions for expansion and contraction with proper fittings, anchors, dresser couplings, loops, etc. Install flexible connectors on each pipe at each building expansion joint.

F. Welding: Refer to Paragraph 1.29 of this section of these specifications.

G. Bending: No bending of pipe will be permitted.

H. General: The installation shall be coordinated with respect to space available with heating, cooling, ventilating, and electrical installation. In every instance where there is a conflict in the routing of the piping and the ducting, the routing of the ducting shall govern. Installed piping shall not interfere with the operation or accessibility of doors or windows, shall not encroach on aisles, passageways, and equipment, and shall not interfere with the servicing or maintenance of equipment. Pipe shall be cut accurately to measurements established at the construction site and shall be worked into place without springing or forcing, properly clearing all openings and equipment. Cutting or weakening of structural members to facilitate piping, installation is not permitted. Pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Piping above ground shall be run parallel with the lines of the building unless otherwise noted on the drawings. Unless otherwise shown on the drawings, horizontal piping shall pitch down in the direction of flow with grade of not less than 1 inch in 40 feet. Piping connections to equipment shall be in accordance with details shown on the drawings or as recommended by the equipment manufacturer. Service pipe valves and fittings shall be kept a sufficient distance from other work to permit finished covering not less than 1/2 inch from such other work, and not less than 1/2 inch between finished covering on the different services.

I. Installation of Valves: Valves shall be installed at the locations shown on the drawings and where specified and where directed at site. Gate valves shall be used unless otherwise shown, specified, or directed. All valves shall be installed with their stems horizontal or above. Where tight shutoff is required, a composition seat globe valve or resilient seat ball valve shall be used.

J. All valves which must be used during operation, all control valve assemblies, instrument control cases, liquid level controls, gage glasses, orifices, relief valves, and other equipment which must be observed, adjusted, or serviced during operation shall be located conveniently accessible from an operating platform or grade.

K. In general, relief valves within processing unit limits shall be located conveniently accessible from an operating platform or grade.
   1. Those in non-hazardous service, such as water, shall discharge directly to outside.
   2. Relief valves should have no piping between the vessel or line and the valve inlet, except as shown on the drawings.
   3. Relief valves shall be installed in a vertical position. Vent piping shall be braced and supported in a manner that will not produce excessive stresses in the relief valve and will permit removal of the relief valve without necessary temporary supports for the vent lines.

L. Equipment Connections: All piping connections to pumps and other equipment shall be installed without strain at the pipe connection of the equipment. The contractor shall be required as directed to remove the bolts in flanged connections or disconnect piping to demonstrate that the piping has been so connected. Pipe connections to equipment shall be made with unions or flanged fittings. Provide removable headers for large equipment for service access.

M. Joints
   1. Flanged Joints: All flanged joints shall be face matched. Raised face flanges shall not be mated to flat-faced cast-iron flanges on valves or equipment. The raised face must be turned off. All flanged bolt holes shall straddle the horizontal and vertical center line unless otherwise noted.
   2. Screwed Joints: Screwed pipe joints shall have American Standard Taper Pipe Threads ANSI-B2.1 Latest Edition. Burrs formed when cutting pipe shall be removed by reaming. Care shall be taken that the inside of pipe is thoroughly clean and free of cutting oil and foreign matter before installation. Joints shall be made perfectly tight by the use of Teflon tape or approved Teflon thread sealing and lubricating compound.
   3. Solder-Joints: Tubing shall be cut square and burrs removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool or wire brush before seating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Joints for serrated fittings on water, compressed air below 60 psig, and vacuum lines shall be made with a 95 percent tin and 5 percent antimony. Cored solder or solder containing lead will not be permitted.

N. Reducers: Reduction in pipe size shall be made with one piece reducing fittings. Bushings reducing at least two pipe sizes will be acceptable only when there is no room for reducing couplings or swaged nipples.

O. Unions: All piping unions shall be of the ground joint type constructed from materials equivalent in alloy composition and strength to other fittings specified with which they are used. Union Pressure classes and end connections shall be the same as the fittings used in the lines with the unions. Steel unions shall have hardened stainless steel seating surfaces on both faces.

1.29 WELDING

A. All welding of piping covered by this specification, regardless of condition of service shall be accompanied as follows:

1. The welding shall be in accordance with the recommendations of the American Welding Society. Mitering of pipe to form elbows, notching to form these, or any similar construction will not be permitted. Welding fittings shall be installed on all welded lines. Joints to be welded shall be properly aligned and spaced, using special welding clamps where necessary. All welders to be employed shall have passed qualification tests prescribed by the National Certified Pipe Welding bureau (or by another reputable testing laboratory or agency) using procedures approved by the American Society of Mechanical Engineers or the American Welding Society. The welders will be required to pass qualification tests when the work of the welder creates a reasonable doubt as to his proficiency. Tests shall be conducted at no additional expense to the Owner.
2. Each welder shall, in addition to having passed the prescribed qualification tests (as noted in Paragraph 1.30.A.1), prepare sample coupons at the job site on a portion of pipe that is cut such that the cross section of the weld is open to view. The sample weld should be prepared using a 6 inch diameter pipe. The sample shall reflect a continuous weld with perpendicular cut out to show the weld in cross sectional view. This sample, when accepted and approved by a certified welding inspector, shall be used as a standard of quality to compare to other welds that this welder will be performing on the job. This same sample weld will also be a basis for accepting or rejecting the welder for working on this project. The sample weld shall be identified with a date and the welder's name and shall be kept at the site throughout the project.
3. All welding on pressure piping shall conform to all of the requirements of the American Society of Mechanical Engineers Code for Pressure Piping - B31.1 (An American National Standards Institute publication), as defined in the latest edition of the ANSI Power Piping B31.1 Manual. All welding shall also conform to all of the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. All chapters, current addenda and supplements of these manuals shall apply. This code shall be used to establish standards of performance and quality of welds. However, the Owner reserves the right to perform radiographic testing of all welds, to compare any of the welds to the approved "standard" sample welds of each welder, and to compare the welds to the welding diagrams and sketches of those recommended in the ANSI B31.1 Power Piping Manual. The intent is to obtain the highest quality welding job possible. The cost of any initial radiographic testing, for random inspection, shall be paid for by the Owner. If radiographic random testing reveals that a weld is defective, the Contractor shall bear the cost of all repairs and re-testing necessary to be made to subject weld until conformance with radiographic tests is reached. The potential for random radiographic testing and welding quality control applies to all pressure piping systems in this project, including systems below 100 psig. If a question should arise regarding the possibility of faulty welding or if there are obvious visual defects in the welding, the Contractor shall be required to correct such deficiencies to a quality level consistent with the recommendations, welding diagrams and sketches in the ANSI B31.1 Manual. The quality level shall also reflect that of the approved sample welds accomplished by each welder for this particular project.

1.30 COOPERATION WITH OTHER TRADES

A. The Contractor shall refer to other sections of these specifications covering the work of other trades which must be carried out in conjunction with the mechanical work so that

the construction operations can proceed without harm to the Owner from interference, delay or absence of coordination.

1.31 FIELD MEASUREMENTS

A. The Contractor shall verify the dimensions covering the mechanical work at the building. No extra compensation shall be claimed or allowed on account of difference between actual dimensions and those indicated on the drawings. He shall examine the adjoining work on which Mechanical work is dependent for maximum efficiency and shall report any work which must be corrected. No waiver of responsibility for defective work shall be claimed or allowed due to failure to report unfavorable work conditions affecting Mechanical work.

1.32 SAFETY GUARDS

A. The Mechanical Contractor shall furnish and install safety guards required in order to obtain certificates of inspection from all authorities having jurisdiction. All belt driven equipment, projecting shafts, and other rotating parts shall be enclosed or adequately guarded. Provide coupling guards on all rotating shafts.

1.33 PROTECTION

A. All work, equipment, and materials shall be protected at all times to prevent obstruction, damage, or breakage. All pipe openings shall be closed with caps or plugs during installation. All equipment shall be covered and protected against dirt, water, chemical, or mechanical injury. At the completion of the work, all equipment shall be thoroughly cleaned and the entire system shall be delivered in a perfect, unblemished condition.

1.34 PAINTING AND IDENTIFICATION

A. All equipment shall be delivered to the job with suitable factory finish. Should the finish be marred in transit or during installation, it shall be finished to present a neat, workmanlike appearance.

B. Except as elsewhere hereinafter specifically required, any painting of equipment, piping, ductwork, grilles, insulation, etc., furnished and installed under this Section of the Specifications will be done by the Painting Contractor. However, the Mechanical Contractor shall leave his equipment clean and free from any grease, dirt, rust, etc., and in suitable condition for painting.

C. No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during the painting operation.

D. The piping shall be painted the basic color as indicated in other sections of these specifications and shall be marked every 10 feet on centers with Brady pipe markers. Arrows, approximately 6 inch in length and spaced about 10 feet on centers shall indicate the direction of the flow pipe. Locate additional labels as required in Mechanical Rooms. Staple in place, brush with clear lacquer. Markers shall state pipe size, flow direction, and pipe usage (such as "cold water," etc.).

1.35 RECORD DRAWINGS

A. The Contractor shall, during the execution of the work, maintain a complete set of drawings upon which all dimensional locations of equipment piping and all deviations and/or changes in the work shall be recorded. Water, storm, and drainage mains shall be delivered to the Architect/Engineer in good condition upon the completion and acceptance of the work and before final payment is made.

1.36 SUPPLIER RESPONSIBILITY

A. Each supplier, whether furnishing equipment as specified or as a substitution shall be responsible for certifying that the equipment is properly installed and that the warranty is valid. Submit written reports on the installation and the equipment performance when requested to do so by the Architect/Engineer (or his representative). Each supplier shall be responsible for furnishing qualified personnel at the job site at anytime requested by the Architect/Engineer (or his representative) during the construction or warranty periods.

END OF SECTION

SECTION 25 1000

DIRECT DIGITAL CONTROL SYSTEM FOR HVAC SYSTEM

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Building Automation System (BAS), utilizing direct digital controls.

1.2 RELATED WORK

A. Native BACnet-based system, with Microsoft Windows 10 compatible operator's workstation. Workstation, building controllers, application controllers, and input/output devices communicate using protocols and network standards per ANSI/ASHRAE Standard 135, BACnet. Workstations, controllers, and unitary controllers, to be native BACnet. Do not use gateways for controller communication. Gateways may be used to communicate with existing systems or systems installed under other sections.

1. BACnet-compliant hardware and software meeting system's functional specifications. Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system.
2. Individual hardware layouts, interconnection drawings, and software configuration from project design data.
3. Implement detailed design for analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.
4. Design, provide, and install equipment cabinets, panels, data communication network cables needed, and associated hardware.
5. Interconnecting cables between supplied cabinets, application controllers, input/output devices, operator's terminals and peripheral devices (including but not limited to printers) supplied under this section.
6. Manufacturer's specifications for items supplied.
7. Specialists and technicians; assist installation, startup, and commissioning.
8. Operator and technician training program as described herein.
9. As-built documentation, operator's terminal software, diagrams, and associated project operational documentation (such as technical manuals) on approved media accurately representing the final system.
10. New sensors, dampers, valves, and new electronic actuators. No used components.
11. Owner will have full licensing and access rights for network management and operating workstation features for ongoing maintenance and operation of BMS.
12. BMS workstation will host graphic files for control system. Graphics and navigation schemes for project are to match any that are on existing site/campus.

1.3 RELATED SECTIONS

A. Relevant Electrical Specifications

B. Relevant Mechanical Specifications.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. Products Supplied but Not Installed Under This Section:
1. Control valves.
2. Flow switches.
3. Wells, sockets and inline hardware for water sensors (temperature, pressure, flow).
4. Automatic control dampers, where not supplied with equipment.
5. Airflow measuring stations.
6. Terminal unit controllers and actuators, when installed by terminal unit manufacturer.
7. Variable frequency drives. (Does not include VFDs integral to chillers or boilers).

B. Products Installed but Not Supplied Under This Section: None.

C. Products Not Furnished or Installed but Integrated with the Work of This Section:
1. Chiller control systems.
2. Boiler control systems.
3. Pump control packages.
4. In-line meters (gas, water, power).
5. Refrigerant monitors.
6. Chemical water treatment.
7. Smoke detectors (through alarm relay contacts).

D. Work Required Under Other Divisions Related to This Section:
1. Power wiring to line side of motor starters, disconnects or variable frequency drives.
2. Provision and wiring of smoke detectors and devices relating to fire alarm system.
3. Campus LAN (Ethernet) connection adjacent to Operator Workstation

1.5 REFERENCES

A. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

B. American National Standards Institute (ANSI): ANSI/ASHRAE Standard 135, BACnet.

C. Underwriters Laboratories:
1. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
2. UL 864 UUKL listing for Smoke Controls for any equipment used in smoke control sequences.

D. NFPA

E. The Federal Communications Commission (FCC): FCC Part 15, Subpart J, Class A

F. National Electrical Code (NEC).

1.6 SPECIFICATION NOMENCLATURE AND DEFINITIONS

A. Acronyms Used in this Specification:
1. ACM: Ascent Control Module.
2. Actuator: Device that opens or closes valve or damper in response to control signal.
3. AI: Analog Input.
4. AO: Analog Output.
5. Analog: Continuously variable state over stated range of values.
6. BAS: Building Automation System.
7. Compass: Alerton Workstation Software.
8. DDC: Direct Digital Control.
9. FC: Fail closed position of control device or actuator. Device moves to closed position on loss of control signal or energy source.
10. FO: Fail open position of control device or actuator. Device moves to open position on loss of control signal or energy source.
11. GUI: Graphical User Interface.
12. HMI: Human Machine Interface.
13. HVAC: Heating, Ventilating and Air Conditioning.
14. LAN: Local Area Network.
15. Modulating: Movement of control device through a range of values, proportional to an infinitely variable input value.
16. Motorized: Control device with actuator.
17. NC: Normally closed position of switch after control signal is removed or normally closed position of manually operated valves or dampers.
18. NO: Normally open position of switch after control signal is removed; or the open position of a controlled valve or damper after the control signal is removed; or the usual position of a manually operated valve.
19. Operator Workstation: PC running Compass software and any required software tools applicable for day-to-day operation of the BMS.
20. P: Proportional control; control mode with continuous linear relationship between observed input signal and final controlled output element.
21. PI: Proportional-Integral control, control mode with continuous proportional output plus additional change in output based on both amount and duration of change in controller variable (reset control).
22. PICS: BACnet Product Interoperability Compliance Statement.
23. PID: Proportional-Integral-Derivative control, control mode with continuous correction of final controller output element versus input signal based on proportional error, its time history (reset) and rate at which it's changing (derivative).
24. Point: Analog or discrete instrument with addressable database value.
25. WAN: Wide Area Network.

1.7 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Construction details, layout, and location of control panels within building, including instrument location in panels and labelling. Indicate mechanical equipment associated with each controller and area in building being served by that equipment. For terminal unit control, a room schedule listing mechanical equipment tag,

room number of space served, address of DDC controller, and pertinent information required for service.

1. Manufacturer's data sheets on each product to be used.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Typical installation methods.

C. Shop Drawings: Material details, construction, finish and adjacent construction relationship.

1. Engineering drawings, control sequence, and bill of materials for approval.
2. Standard Sizes for Drawings: 11 inches x 17 inches (ANSI B).
3. Eight complete physical sets of submittal drawings, and approved electronic media.

D. System Documentation: Include the following in submittal package.

1. System Configuration Diagrams: Simplified block format. Note software addressing for device communications for devices. Indicate locations of ethernet switches.
2. Input/output object listings and an alarm point summary listing.
3. Electrical drawings showing system internal and external connection points, terminal block layouts, and terminal identification.
4. Bill of materials, valve schedule, and damper schedule.
5. Instructions and drawings, for installation, operation, maintenance, preventive maintenance, troubleshooting, and spare parts for list control devices.
6. BACnet Protocol Implementation Conformance Statements (PICS) per ASHRAE Standard 135: For system elements-Operator's Workstations, building controllers, application controllers, routers, and repeaters.
7. Description and documentation of proprietary (non-BACnet) services and/or objects.

E. Project Management: Detailed project design and installation schedule with time markings and details for hardware items and software development phases.

1. Target dates for transmission of project information and documents. Indicate timing and dates for system installation, debugging, and commissioning.
2. Supply products to affected trades in time to prevent interruption of construction.
3. Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified. Five years documented experience.

1. BAS System: Designed, installed, commissioned, and serviced by manufacturer authorized and trained personnel. Support facility within 2 hours response time of site with technical staff, spare parts, and test and diagnostic equipment.
2. Contractor: Full-time, on-site, experienced project manager responsible for supervision of design, installation, start-up and commissioning or BAS.
3. Materials and Equipment: Latest standard design complying with requirements.
4. UL Listed under Standard UL 916, category PAZX: BAS peer-to-peer network controllers, central system controllers and local user displays.

5. Electronic Equipment: Conform to requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
6. Control System: Engineered, programmed and supported by representative's local office/ No less than four hour response, 24 hours a day, 7 days a week.

B. Installer Qualifications: Two years documented experience with projects of similar scope and complexity.

1.9 PRE-INSTALLATION CONFERENCE

A. Convene approximately two weeks before scheduled Work commencement. Attendees to include Architect, Contractor and trades involved. Agenda: Include schedule, responsibilities, critical path items and approvals.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.11 PROJECT CONDITIONS

A. Maintain environmental conditions within limits recommended by manufacturer for optimum results. Do not install products in environmental conditions outside recommended limits.
1. If ambient conditions are not met at time of delivery, manufacturer reserves the right to void the warranty.

1.12 WARRANTY

A. Manufacturer's Warranty: Limited warranty against defects in materials and workmanship. Covers costs for parts, labor, associated travel, and expenses for a period of one year from completion of system acceptance and applies equally to hardware and software.
1. Personnel supporting the hardware and software warranty agreement will provide on- or off-site service in a timely manner after failure notification. Acceptable Response Time: Within 24 hours, Monday through Friday; 48 hours on Saturday and Sunday.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Alerton, Trane, or approved equal.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 SYSTEM DESCRIPTION

A. Except as indicated, system supplier to secure and pay for all permits, inspections, and certifications required for his work, and arrange for necessary approvals by the governing authorities.

B. BAS: Network of interoperable, stand-alone building controllers, field controllers on logical networks, graphics and programming for complete system.
   1. Password access to features, functions and data contained in BAS.
   2. Software for complete operating system, as specified, as integral part of supervisory controller. Not dependent upon higher level computer for execution.
   3. System Backup: Electronic copies of software, project graphics, setpoints, and system parameters. Backups will allow Owner to restore system if necessary.

C. Distributed Logic Control System: Software and hardware per ANSI/ASHRAE Standard 135.
   1. System controls mechanical equipment, including unitary equipment such as fan-coils, AC units, air handlers, boilers, chillers, and listed equipment using native BACnet-compliant components.
   2. Operator's Workstation Software: BAS application written utilizing BACnet protocols. Software functions to include password protection, scheduling, alarming, logging of historical data, full graphics including animation, after-hours billing, demand limiting, and full suite of field engineering tools including graphical programming applications.
      a. Programming to make future changes to e system, controllers, field level devices, system changes, scheduling, and trending.
      b. Field engineering tools, graphical programming and applications.
   3. Building Controllers: Building management software, with scheduling building control strategies and optimum start and logging.
      a. Energy Management Software/Firmware: Resident in field hardware.
      b. Operator's Terminal Software: Used to access field-based building management functions. Zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage.
   4. Room Sensors: Viewable digital readout of room temperature, and outside air. Adjustable room setpoint within preset limits and set desired override time. Start and stop unit from digital sensor. Include wiring and firmware for field service mode allowing technicians to balance VAV zones and access parameters in zone controller directly from room sensor. Field service mode must have ability to be locked out.
   5. Application Controllers: Terminal units including VAV, HP and UV, air handler, central plant equipment, and other controlled equipment to be programmable. Mount next to controlled equipment. Communicate with building controller through BACnet LAN.

2.3 OPERATOR WORKSTATION (COMPASS)

A. Structure of Workstation Interaction: Client/server relationship. Embedded web server for browser access. Server to archive data and store system. Operator Workstations to support operation. Virtualized server environment. Web clients may access archive server data.

1. Single Server License Shall:
    a. Maximum Devices to be Connected: As indicated on Drawings.

B. Operator Workstation: General purpose, commercially available, personal computer.
1. Processor: Minimum speed of 2.5 GHz.
    a. Eight core processor.
    b. RAM: 16 GB.
    c. Hard Drive: Minimum of 1 TB.
    d. Network Interface Card: 1000 Mbs.
    e. Provide more memory and/or a faster processor if necessary to perform the functions described in this specification.

C. Sufficient storage to accommodate fully configured point databases, application databases, graphics files, user-defined reports, and historical data archived as specified.

D. Graphic Based Displays: For each system.
1. Operator Workstation: Point data for each system. Update every 30 seconds.
2. Dynamically update data any action by user.
3. Graphic Displays: Iconic graphic representations of mechanical equipment. Display graphic files, text, trendlog, and dynamic object data displays including animation.
4. Graphic Displays: "Drill Down" capability from main display to more specific system displays or navigation tree for building equipment and system diagnostic centric display organization.
a. Tree Navigation Contents: Customizable per-user and per-group basis.
5. Systems with Terminal Unit Controls: Building floor plan with dynamic temperatures, drillable for more specific terminal information.
6. Points on graphics allow user to change field-resident Operator Workstation functions associated with project, including setpoints, weekly and exception schedules, from any screen, whether screen shows text or graphic display. Do without reference to object addresses or other numeric/mnemonic indications.
7. Protect display views unless operator credentials have proper access level. Assign access levels to each display/system object. Menu labels not to appear on graphic if operator does not have appropriate security level.
8. Analog objects: Displayed with operator modifiable units. Input objects may be displayed as graphic items on display screen as an overlay to the system graphic.
9. Information: Labeled with descriptors and shown with appropriate engineering units.
10. DDCs system must provide graphic displays and files. Systems requiring graphics development or logic programming are prohibited. Graphic Files: JPG, GIF or PNG.
11. Submit graphic displays to Owner for review and approval. Approved graphics to be in place prior to commissioning.
12. Operator Workstation: Supply graphics library, to use unaltered or modified. Include library to assemble custom graphics. System to allow creation of new graphics.
13. Data Displays: Ability to link to content outside of BAS system. Content to include, but not limited to launching external files in their native applications.

E. Omnigraphics: Graphics with custom geometry offering color gradient shading and variable opacity in scale to system variables; analog and digital, and color range settings.

1. Omnigraphics Must Support:
    a. Displaying current values in the geometric shapes.
    b. Geometric shapes to be clickable allowing another graphic display.
    c. Color Scale: Support using AV's to define the color scale ranges.

F. The Operator Interface: Support the following functions.
1. Mouse-over tooltip information of graphic items or data points; can be turned off.
2. Right click capability to access system functionality such as Schedule, Trendlogs, and Alarms associated with display object selected.
3. Automatic zooming to screen size to maximize display to display area. Can be enabled or disabled. Background color, flood fills remaining screen background.
4. Support user configurable embedded Data Viewer for a persistent trend log data view to accompany system data and graphic information on a single display.

G. Password Protection: Preventing unauthorized use unless operator is logged on.
1. Limits operator to assigned functions when logged on. Includes displays as outlined.
2. Users: Individual User IDs, Usernames, and Passwords. Case sensitive alphanumeric character entry except for User ID. User ID, Username, and Password will enforce minimum of 8 characters and stored in encrypted format.
3. Each user to be allowed individual assignment of control functions, menu items, navigation tree, and user-specific system start display, and restricted access to discrete BACnet devices to which user requires access.
4. Passwords, usernames, and access assignments: Adjustable via Compass. Password adjustable via web client.
5. Users to have set access levels, which define access to displays and individual objects user may control. System to have 10 distinct access levels for assignment.
6. Operator Workstation and Web Client: Auto logout feature when no keyboard or mouse activity is detected for time period, adjustable by system administrator. Enabled and disabled by system administrator. Screen message notifying log out.
7. Permit effective date range, and effective time of day, User are permitted access.
8. Operator Workstation: Support LDAP integration enforcing strong password policies.

H. Operator Activity Log: Tracks operator changes and activities.
1. Included in Operator Workstation. A log of what changed, who made the change, date and time of system activity, and value of change before and after. Operator may display activity, sort changes by user or operation and print Operator Activity Log.
2. Activity log to be gathered and archived to MSDB as needed. Log to be able to exportable for spreadsheet display and sorting.
3. User option to record commenting in Operator Activity Log upon system point change.
4. Accessible via Web Client for viewing, sorting, filtering, and printing.

I. Scheduling:
1. Information to be in easy-to-read daily format including calendar of this month and next. Schedules to show actual ON/OFF times for day based on scheduling priority. Priority for Scheduling: Events, holidays and daily, with events being the highest.
2. Holiday and Special Event Schedules: Display data in calendar format. Be able

to schedule holidays and special events directly from these calendars.

3. Operator to be able to change information for a given weekly or exception schedule if logged on with appropriate access privileges.
4. Schedule Wizard for schedules set up. Walks user through schedule generation. Have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting Schedule.
5. Scheduling: Include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and previous starts history. Individual zones to have optimum start time calculated based on parameters listed. Operators to input schedules to set time that occupied setpoint is to be attained. Optimum start feature must calculate the startup time needed to match zone temperature to setpoint. Operators to be able to set a limit for maximum startup time allowed.
6. List show currently defined schedules. Includes standard, holiday and event schedules. User to be able to select a list showing scheduled points and zones.
7. Display of schedules must show ON times for standard, holiday and event schedules in different colors on a given day. OFF times must also be shown in additional colors. Operators may select from a calendar what days are to be scheduled and show points and zones affected. Operators may set time for one day and then match it to days of the week to be affected as a recurrence of same schedule.
8. Any displayed data that is changeable by operator may be selected using the right mouse button and schedule selectable on screen. Selection of schedule using this method allows viewing of assigned schedule and allows the point to be scheduled.
9. Schedule Support Functions: Drag-n-drop events and holidays on schedule calendar.
    a. Drag-n-drop events default to two-hour period; can operator adjusted.
    b. Drag-n-drop holidays default for OFF all day; edit for multiple-day holidays.
    c. View affected zones when adding or editing timed events of a schedule.
10. Web Client: A search list of scheduled points and zones to access schedule calendar.
11. Schedule Time Blocks: Present schedule detail via mouse-over information.

J. Advanced Scheduling:
1. Each resource shall have its own unique schedule object.
2. Both analog and binary points shall be scheduled.
3. Holiday schedules shall support perpetual holidays
4. Calendar Events Set to be Reoccurring Events: Daily, weekly, monthly and annually as well as a non-pattern occurrence by selecting groups of days so they can be edited on one occurrence.

K. Alarm Indication and Handling: Visual, printed, and email means of alarm indication.
1. Printout of Alarms: Sent to assigned terminal and port. May be filtered based on User ID's authorization level.
2. Web Client: Display persistent alarm state for system regardless of data view including points in alarm but not acknowledged, and points that have gone into alarm and returned to normal without being acknowledged.
3. Recorded and archive at the Operator Workstation:

a. Description of event and equipment initiating alarm. 256 characters in length.
b. Time and date of alarm occurrence.
c. Time and date of object state return to normal.
d. Time and date of alarm acknowledgment
e. Identification of operator acknowledging alarm.

4. Alarm messages: User-definable text, English or other specified language, and delivered to operator's terminal, client, or remote communication using email; authenticated SMTP supported.
5. Allow for set up of alarms. User interface will walk user through steps necessary.
6. Alarm annunciation includes navigation link to a user-selected display or URL.
7. Displayed data changeable by operator is right mouse button selectable. Alarm is then selectable on screen allowing view of alarm history or allow new alarm creation.

L. Trendlog Information: Display trendlog records in standard engineering units.
1. Periodically gather data stored in building controllers and store information in system database. Append stored records with new data. Overwriting records is not allowed unless file size is limited. System database capable of storing 50 million records before archiving data. Samples viewable at Web Client.
a. Capable of trending on interval determined by polling rate, or change-of-value.
2. Add and edit trendlogs and setup information including the following:
a. The interval at which it is to be logged.
b. Operations shall be password protected.
c. Accessed directly from graphics on which a trended object is displayed.
3. Trendlog Wizard: Setup of multiple trend logs simultaneously. Walk users through necessary steps. Have a pull-down selection for startup, or by right-clicking on value displayed on graphic, and then selecting Trendlogs from displayed menu.
4. Trendlog Data: Viewable on Datalogger accessible via Web Browser. Trend logs of any point on a graphic must be initiated by performing a right mouse click on the point.

M. DataViewer access via Web Browser: Capable of graphing trend-logged object data.
1. Access and ability to create, edit and view are restricted by user account credentials
2. Specific and repeatable URL defines trendlog views for browser bookmarking and email compatibility.
3. Call out of trendlog value at intersection of trend line and mouse-over vertical axis.
4. Trendlog or Energy log and companion logs configurable to display on one of two independent vertical scales embedded in display.
5. Click zoom for control of data set viewed along either graph axis.
6. User-specifiable start and end dates and fast scroll features supporting click zoom of macro scale view of data for quickly finding data set based on visual signature.
7. User export of the viewed data set to MS Excel.
8. Optional min/max ranges (Upper Control Limits, Lower Control Limits) for each value.

N. Energy Log Information: Display information in standard engineering units.
1. Periodically gather energy log data in field controller and archive information. Append files with new data. Overwriting archived data is not allowed unless file size is limited.
2. Store data in database format for use by third-party programs. System operation to stay online during graphing operations.
3. Operators to be able to change energy log setup information. Includes meters, meter pulse value, and type of energy units. Meters monitored by system may be logged. Support using flow and temperature sensors for BTU monitoring.
4. Web Client: Display data in tabular and graphical formats. Display in hourly, daily, weekly, monthly and yearly formats. Be able to select specific data periods to view.

O. Demand Limiting: Sheds and restores equipment based on energy usage when compared to shed and restore settings.
1. Shedding: Implemented independently on each zone or piece of system equipment.
2. Binary Shedding: 5 priority levels. Loads in a given priority level to be shed before any loads in a higher priority level are shed. Load shedding within a given priority level includes two methods; a "first off-first on" mode, and a "first off-last on" linear mode.
3. Analog Shedding: Program generated ramp used by individual zones or control algorithm to raise and lower cooling and heating settings reducing energy usage.
4. Status of each program to be displayed with description of each load on Web Client.

P. Reports: Capable of producing the following reports.
1. Trendlog configurations.
2. Alarm configurations.
3. Tenant activity configurations.
4. Device summary.
5. Energy log configurations.
6. Schedule configurations.

Q. Field Engineering Tools: For programming controllers supplied.
1. Database Application Manager: Include controller logic files and associated graphics.
2. Device Manager: Detect devices connected on BACnet network by scanning. Display device instance, network ID, model, and description. Record and display software file loaded in each controller. Store file copies in project folder on computer's hard drive.
3. Audit when device not in database is added to network.
4. Backup/restore function for system to selected medium. System to be capable of restoring systems and creating a backup for instantiating a new client PC.
5. A means to scan, detect, interrogate, and edit third-party BACnet devices and BACnet objects within those devices.

R. Web Interface: System software based upon server/thin client architecture, designed around open standards of web technology.
1. Communicate using Ethernet and TCP. Access server using a web browser across Owner’s intranet and remotely via the Internet. Support 200 users with single

license.

2. Web Browser: Microsoft Internet Explorer v11 or later, Firefox 70 or later, Chrome 78 or later, and Safari 13 or later. No special vendor-supplied software to be required. Display data in real-time. Update automatically without user interaction.
3. Web Pages: Automatically generated with HTML5 from data display files on Operator Workstation. Do not use systems requiring an HTML editor for web page generation.
4. Launching Web Browser on Operator Workstation presents a login page requiring a login name and password. Navigation and system adjustments dependent upon operators assigned privileges. User activity reports will show activity of operators, whether changes were made using a web client or Operator Workstation.
5. User Session Management including ability to view connected user sessions to the web client, see how long they have been active/inactive for each unique session, and force log-out for any or all sessions.

S. Context Menu Navigation: Web Browser: Support Context Menu Navigation via a right mouse click on a data point.
1. Operations to be dependent upon logged in user privileges and include:
   a. View and setup Alarms.
   b. View and setup Trend Logs.
   c. Display the BACnet properties for the selected Object.
   d. View and setup Schedules.
   e. View System activity for the selected Object.

T. Summary Pages:
1. Present system data in tabular form. Data to be from multiple devices. Points presented horizontally and devices listed on left side of table.
2. Built using spreadsheet that can be imported into Operator Workstation.
3. Data in summary pages to be live. Configure each object to be read only or writeable.
4. Both analog and binary data shall be supported.
5. Summary page, when populated, captured for archiving and review for analysis.
6. The data shall be sortable by clicking on the column headings.

U. Advance Scheduling (EASE): Managed and arranged in multi-tier hierarchy.
1. Access through hierarchy to be controlled via login credentials.
2. Configured for MS SQL 2014/17/19 Enterprise.
3. The Advanced Schedule Application:
   a. Apply conflict resolution logic for effective scheduling.
   b. Assign Work, Week and Holiday schedules for multiple resources.
   c. Create schedules with analog and binary resources.
   d. Create events for parent resources or children using inheritance.
   e. Customize event recurrence.
   f. Use Resource Picker to search and select resources.
   g. Create custom templates to hold the resource and event time.
   h. Schedule Operations Status: Use notification banner. Verify changes in resource tree.
   i. Verify event type applied to resource with indication given by resource hierarchy/tree.

2.4 BUILDING CONTROLLER (ACM)

A. General Requirements:
1. BACnet Conformance: Approved by BTL as meeting BACnet Building Controller requirements.
   a. Refer to ANSI/ASHREA 135, for a complete list of the services that must be directly supported to provide each of the functional groups listed above.
   b. Proprietary services, if used, document and provide as part of submittal data. Provide tools for working with proprietary information.
2. Scalable: Number of trunks and protocols selectable to fit project requirements
3. Capable of panel-mounting on DIN rail and/or mounting screws.
4. Global control strategies based on information from any objects in system, regardless if object is directly monitored by building controller module or by another controller.
5. Capable of running 6 independent control strategies simultaneously. Modification of one control strategy does not interrupt function or runtime others.
6. Software implementing DDC strategies to be completely flexible and user definable.
7. Software Programming Tools: Provide as part of project software. Factory pre-programmed global strategies not modifiable by field personnel are not acceptable. Changing global strategies via firmware changes is also unacceptable.
8. Programming: Object-oriented control function blocks and support DDC functions. Flowcharts: Generated and automatically downloaded to controller. Programming tool to be resident on workstation. used same tool for controllers.
9. Graphically view inputs and outputs to each program block in real-time as program is executing. Function may be performed using operator's workstation or field computer.
10. Controller: 6,000 Analog Values and 6,000 Binary Values.
11. Controller IP configuration: Via direct USB connect or field computer.
12. Quad Core 996 Ghz processor to ensure fast processing speeds.
13. Execute control algorithms and automated control functions with 64-bit processor.
14. Minimum of 1 GB of DDR3 SDRAM on a 533 Mhz bus to ensure high speed data recording, large data storage capacity and reliability.
15. Support 2 on-board EIA-485 ports capable of supporting various EIA-485 protocols including, but not limited to BACnet MS/TP and Modbus. Ports capable of supporting EIA-485 protocols including, to BACnet MS/TP and Modbus.
16. Support 2 ports-each of gigabit speed-Ethernet (10/100/1000) ports. Ports are capable of supporting Ethernet protocols including, BACnet IP, FOX, and Modbus.
17. Ports capable of having protocols assigned to utilize port's physical connection.
18. Minimum 4 onboard inputs, 2 universal inputs and 2 binary inputs.
19. Schedules:
   a. Normal seven-day scheduling, holiday scheduling and event scheduling.
   b. Support 380 BACnet Schedule Objects and 380 BACnet Calendar Objects.
20. Logging Capabilities:

a. Log 2,000 objects at 15-minute intervals. Any object in system may be logged. Sample time interval adjustable at operator's workstation.
b. Viewed logs on-site or off-site using WAN or remote communication.
c. Periodically upload trended data to operator's workstation for archiving. Archived data available for use in spreadsheet or database programs.

21. Alarm Generation: Within the system for any object change of value or state, includes analog and binary object state changes, and controller communication failures.
a. Each alarm may be dialed out as noted elsewhere.
b. Provide alarm log for alarm viewing. Log may be viewed on-site at operator's terminal or off-site using remote communications.
c. Handle up to 2,000 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.
22. Demand Limiting of Energy: Built-in, user-configurable function.
a. Controller modules support shedding up to 1,200 loads.
b. Load shedding programs to operate as defined herein.
23. Tenant Activity Logging: Supported by a building controller module. Each independent module to support a 380 zones.
a. Tenant Activity logging to function as defined herein.

B. BACnet MS/TP:
1. BACnet MS/TP LAN must be software-configurable from 9.6 to 115.4 Kbps
a. Each BACnet MS/TP LAN shall support 64 BACnet devices at a minimum.
b. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.

C. BACnet IP:
1. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the local area network (LAN).
2. Must support interoperability on WANs and campus area networks (CANs), and function as a BACnet Broadcast Management Device (BBMD).
3. Each controller shall support at a minimum 128 BBMD entries.
4. BBMD management architecture shall support 3,000 subnets at a minimum.
5. Shall support BACnet Network Address Translation.
6. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.

D. Expansion Ports:
1. Controller shall support two (2) expansion ports.
a. Combining the two on-board EIA-458 ports with fully loaded expansion ports, the controller shall support six (6) EIA-485 trunks simultaneously.
2. Expansion Cards: Mate to the expansion ports, shall include the following.
a. Dual port EIA-485 card.
b. 78 kbps FTT10A LON network card.

E. Modbus Protocol Support:
1. Controller shall support reading from and writing to TCP Slaves and Serial Connections (RTU or ASCI over either EIA-485 or EIA-232).
   a. Shall be capable of mapping Modbus register coil data to BACnet AV, BV, MV, AI, BI, and MI object types.
   b. Support a minimum of 6000 Mapped Modbus points.
2. Support up to 384 virtual groupings of Modbus points where each grouping is represented as a single virtual BACnet device.
   a. Virtual BACnet devices support BACnet Change Of Value (COV) notifications
   b. Each Virtual device has diagnostic information for troubleshooting Modbus point mapping. Diagnostic point should include the following.
      1) Number of points mapped.
      2) Number of messages Transmitted and Received.
      3) Modbus Exception Counts.
      4) Display of last exception message.
      5) Serial Setting (Baud rate, Parity, Stop Bits).
3. Integration Performance: Data age of integrated point shall be capable of 1 second for 5000 points.

F. Niagara Framework:
1. Controller shall utilize the Tridium Niagara Framework.
   a. Niagara Framework shall be version 3.8 or newer.
   b. Niagara licensing shall be stored on a removable MicroSD card for fast in-field replacement of controller.
2. The Niagara License for the controllers shall be an open license.
   a. The controller shall be programmable via Niagara Workplace programming tool.
   b. The controller shall be programmable via a Niagara embedded Workplace programming tool.

G. Power Supply:
1. Input for power: Accept between 17 and 30 VAC, 47 and 63 Hz.

H. Controller: Shall be in compliance with the following.
1. UL 916 for open energy management.
2. FCC Class B.
3. RoHS Compliant.
4. IEC 60703.
5. C-Tick Listed.
6. CE (EN 60730-1).

I. Controller: Operate in the following environmental conditions.
1. Without Battery: Minus 4 to 149 degrees F (Minus 20 to 65 degrees C).
2. Relative Humidity: 0 to 95 percent, non-condensing.

2.5 CENTRAL PLANT AND AIR HANDLER APPLICATION CONTROLLERS

A. General Requirements:
1. One or more native BACnet application controller for each air handler as needed for central plant control to adequately cover objects listed in object list.

2. Interface to building controller through MS/TP LAN using BACnet protocol, or Ethernet LAN using BACnet over Ethernet or BACnet TCP/IP. Do not use gateways.
3. Include input, output and self-contained logic program as needed for complete control of units. Fully programmable using graphical programming blocks. Resident programming tool on operator workstation. Same tool used for building controller. Do not use auxiliary or non-BACnet controllers

B. BACnet Conformance:
1. Approved by BTL meeting BACnet Advanced Application Controller requirements.
2. Refer to ANSI/ASHREA 135, for a complete list of services directly supported to provide each of the functional groups listed. Proprietary services, to be documented and provided in submittal data. Supply tools for working with proprietary information.
3. Object types supported include, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Multi-state Values, Device, File, and Program object types. Proprietary types, to be documented and provided in submittal data. Supply tools for working with proprietary information.

C. Direct Digital Controls:
1. Include universal inputs with 12-bit resolution that accept 3K and 10K thermistors, 0 to 10 VDC, Platinum 1000 ohm RTD, 0 to 5 VDC, 4 to 20 mA and dry contact signals. Inputs on controllers may be analog or digital. A minimum of 3 inputs that accept pulses. Include binary and analog outputs on board. Analog outputs with 12-bit resolution to support either 0 to 10 VDC or 0 to 20 mA. Binary outputs: LED indication of status. Software must include scaling features for analog outputs. Include 20 VDC for use as power supply to external sensors.
2. Outputs must have onboard Hand-Off-Auto (HOA) switches and status indicator light. Monitor HOA switch position. Analog outputs will include potentiometer for manual adjustment of output when HOA switch is in Hand position.
3. Every HOA switch position to be available system wide as a BACnet object property.

D. Programmable Controller:
1. Program sequences shall be stored on board application controller in EEPROM. No batteries shall be needed to retain logic program. Program sequences shall be executed by controller up to 20 times per second (minimum of 10 times per second) and capable of multiple PID loops for control of multiple devices. Calculations shall be completed using floating-point math and system shall support display of information in floating-point nomenclature at operator's terminal.
2. The following control blocks shall be supported.
    a. Natural Log.
    b. Exponential.
    c. Log base 10.
    d. X to the power of Y.
    e. Nth square root of X.
    f. 5th Order Polynomial Equations.
    g. Astronomical Clock (sunrise/sunset calculation).
    h. Time based schedules.

3. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using programming tools as described in Operator's Workstation section.

E. Schedules: The controller shall support a minimum of 3 BACnet Schedule Objects and have a real time clock on board with battery backup to maintain time through a power loss.

F. Logging Capabilities:
1. Controller shall support a minimum of 50 trendlogs. Any object in the controller (real or calculated) may be logged. Sample time interval shall be adjustable at the Operator's Workstation.
2. Controller shall periodically upload trended data to system server for long-term archiving if desired. Archived data stored in SQL database form and shall be available for use in third-party spreadsheet or database programs.

G. Alarm Generation:
1. Alarms may be generated within the controller for any object change of value or state (either real or calculated). This includes things such as analog object value changes, and binary object state changes.
2. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
3. Controller must be able to handle up to 25 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

H. Power Supply:
1. Input for power shall accept between 17 and 30 VAC, 47 and 63 Hz.
2. Power Input/Output expansions separate and shall be 24 VAC 50/60 Hz, 20 VA minimum and half-wave rectified. Output loads are powered separately.
3. Optional rechargeable battery for shutdown of controller including storage of data in flash memory.
4. On-board capacitor will ensure continuous operation of real-time clocks for minimum of 14 days.

I. Controller: Shall be in compliance with the following.
1. UL 916 for open energy management
2. FCC Part 15 Class B
3. ICES-003 Issue 6
4. EN 60703-1

J. The controller processor shall be a 64-bit processor.

K. The packaging of the controller shall provide operable doors to cover the terminals once installation is complete. The housing of the controller shall provide for DIN rail mounting and also fully enclose circuit board.

2.6 EXPANDABLE ADVANCED APPLICATION CONTROLLERS

A. General Requirements:
1. Provide control strategies for system based on information from connected inputs. Program implementing strategies to be fully programmable, completely flexible and user definable.
2. An onboard real-time clock must support schedule operations and trendlogs. Conform to B-AAC BACnet specification, with 24-hour power fail backup.
3. Control algorithms and automated control functions: Use 32-bit processor.
4. A built in 4-port Gigabyte switch supporting 10/100/1000 Base-T. Up to three Ethernet ports to be disabled via software configuration if required.
   a. Support the following ethernet network topologies:
      1) Star.
      2) Daisy Chain.
      3) Ring.
5. BACnet communication over Ethernet and protocols include:
   a. BACnet/Ethernet.
   b. BACnet/IPv4.
   c. BACnet/IPv6.
6. Base unit of controller to host 8 expansion modules with various I/O combinations. These inputs and outputs include universal 16-bit inputs, binary outputs, and analog outputs (0 to 10 V or 0 to 20 mA). Inputs support 3K and 10K thermistors, 0 to 5 VDC, 0 to 10 VDC, 4-20 mA, dry contacts and pulse inputs directly.
7. Support for intelligent room sensor. Room sensor display to be programmable at controller and include operating and field service modes. Button functions and display data to be programmable to show specific controller data in each mode based on which button is pressed on the sensor.
8. Provide 172 discreet inputs/outputs per base unit.
9. Advanced VAV application controller to have a visual indicator (LED) of device status.
   a. No power to controller.
   b. Unit Initializing.
   c. Firmware running with no I/O communicating.
   d. Firmware running with I/O communicating.

B. Direct Digital Controls:
1. Provide means to graphically view inputs and outputs on each program block in real-time as program is executing. This function may be performed using the Operator Workstation.
2. Expandable advanced application controllers shall include universal inputs with 16-bit resolution that accept 3K and 10K thermistors, 0 to 10 VDC, 4 to 20 mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of five inputs that accept pulses. Controller shall include binary and analog outputs on board. Analog outputs with 16-bit resolution shall support either 0 to 10 VDC or 0 to 20 mA. Binary outputs shall have LED indication of status. Software shall include scaling features for analog outputs.
3. Expandable advanced application controller shall include 20 VDC voltage supply for use as power supply to external sensors.
4. Outputs must have onboard Hand-Off-Auto (HOA) switches and a status indicator light. HOA switch position shall be monitored. Each analog output shall

include a potentiometer for manually adjusting the output when the HOA switch is in the Hand position.

5. The position of each and every HOA switch shall be available system wide as a BACnet object property.

C. Programmable Controller:

1. Programming shall be object-oriented using control program blocks. Controller shall support a minimum of 120 Analog Values and 100 Binary Values. Up to 50 analog and binary values shall support standard BACnet priority arrays. Programming tool shall be provided with the Operators Workstation and shall be the same tool that is used to program the expandable advanced application controller.
2. Program sequences shall be stored on board expandable advanced application controller in EEPROM. No batteries shall be needed to retain logic program. Program sequences shall be executed by controller up to 1 time per second and capable of multiple PID loops for control of multiple devices.
3. The following control blocks shall be supported:
   a. Natural Log.
   b. Exponential.
   c. Log base 10.
   d. X to the power of Y.
   e. Nth square root of X.
   f. 5th Order Polynomial Equations.
   g. Astronomical Clock (sunrise/sunset calculation).
   h. Time based schedules.
4. Programming of expandable advanced application controller shall be completely modifiable in the field over installed BACnet LANs. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Expandable advanced application controller shall be programmed using programming tools as described in Operator's Workstation section.

D. Schedules: Expandable application controllers to support 50 BACnet Schedule Objects.

E. Logging Capabilities:

1. Each expandable advanced application controller shall support trendlogs. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
2. Controller shall periodically upload trended data to system server for long-term archiving if desired.
3. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

F. Alarm Generation:

1. For any object change of value or state (either real or calculated); analog object value changes, binary object state changes, and controller communication failures.
2. Alarm log: Provided for viewing operator's terminal or off-site with remote access.
3. Controller must handle alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

G. BACnet Conformance:
1. The expandable advanced Application Controller shall, support Ethernet BACnet LAN types. It shall communicate directly through these BACnet LANs as a native BACnet device. Controllers shall be approved by the BTL as meeting the BACnet Advanced Application Controller requirements.
2. Refer to ANSI/ASHRAE 135, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. Proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Binary Input, Analog Output, Binary Output, Analog Value, Binary Value, Device, File, Group, Event Enrollment, Notification Class, Program, and Schedule object types. Necessary tools shall be supplied for working with proprietary information.
4. The Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN.
5. The Expandable advanced application controller shall have the ability to:
   a. Be disabled from traffic to and from other subnets.
   b. Subscribe to COV subscriptions at a definable interval.

H. Security:
1. The advanced application controller shall be configured with passwords of eight or more characters for:
   a. Console configuration.
   b. Backup and restore.
   c. Disable traffic to and from other subnets.
   d. Protect backup/restore/restart.

I. Power Supply: Input for power shall accept between 20 and 30 VAC, 50/60 Hz. Half wave rectified. Output loads are powered separately.

J. Controller shall be in compliance with the following:
1. UL 916 for open energy management.
2. FCC Part 15 Subpart J, Class A.
3. EMC Directive 89/336/EEC.

K. Controller shall operate in the following environmental conditions:
1. Minus 4 to 131 degrees F (Minus 20 to 55 degrees C).
2. 0 to 95 percent relative humidity (RH), non-condensing.

2.7 TERMINAL UNIT APPLICATION CONTROLLERS

A. General Requirements:
1. One native BACnet application controller (B-ASC) for each piece of unitary mechanical equipment that adequately covers objects listed in object list for unit.
2. Interface to building controller through MS/TP LAN using BACnet protocol. No gateways to be used. Controllers to include input, output and self-contained logic program as needed for complete control of unit.

3. Microprocessor-based, multi-tasking, real-time digital control processor. Each controller shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network.
4. Sufficient memory to support system setpoints, proportional bands, control algorithms, and other programmable parameters shall be stored such that a power failure of any duration does not necessitate any reprogramming. Each application controller shall return to normal operation upon restoration of power.
5. Setpoint and input/output point data shall be accessible through any operator workstation, web browser and building controllers.
6. Ability to download and upload configuration data via the operator workstation.
7. One copy of any programming tool required to configure or program the controllers shall be provided to the Owner along with appropriate documentation.
8. Include universal inputs accepting 3K and 10K thermistors, 0 to 5 VDC, 4 to 20 mA, dry contact signals and a minimum of 3 pulse inputs. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board with analog outputs as needed.
   a. Resolution: 16 bit.
9. Ambient Space Rating: 0 to 158 degrees F and 5 to 95 percent RH.
10. Include support for intelligent room sensor. Display on room sensor to be programmable at controller and include an operating and field service mode. Button functions and display data to be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

B. BACnet Conformance:
1. As a minimum, support MS/TP BACnet LAN types. They shall communicate directly using this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as a native BACnet device. Application controllers shall be approved by the BTL as meeting the BACnet Application Specific Controller requirements and support BACnet services necessary to provide the following BACnet BIBBs:
   a. Data Sharing - DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B.
   b. Device and Network Management - DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-TS-B, DM-RD-B.
2. Refer to ANSI/ASHRAE Standard 135, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. Proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data.
3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program Object Types. Proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. Necessary tools shall be supplied for working with proprietary information.
4. Application Controllers:
   a. BACnet Protocol Implementation Statements per ANSI/ASHRAE Standard 135.
   b. Conform to FCC Part 15, Subpart J, Class A.

C. Custom Programs: Standalone application controllers for, but not limited to, the following application types: Custom Air Handling Units, Boiler Plant and Chiller Plant.

D. Application Specific Controllers:
1. Support, but not limited to, the following system types to address specific applications: Rooftop Air Handlers, VAV terminal units and Fan Coil Units.
2. Application Specific Descriptions:
a. VAV/CAV Unit Application Controllers:
1) One native BACnet application controller for each VAV box covers objects listed in object list for unit. Interface with building controller via MS/TP LAN using BACnet protocol. Do not use gateways. Include on board CFM flow sensor, inputs, outputs and programmable, self-contained logic program as needed for control of units.
2) Support, but not be limited to, control of the following configurations of VAV boxes to address current requirements described in Execution portion of specification, the operational sequences described in Division 23, and for future expansion:
a) Single duct, cooling only with or without reheat.
b) Dual duct.
c) Fan powered (series or parallel).
3) Support the following types of inputs and outputs:
a) Variable Air Volume control outputs.
b) Reheat control outputs.
c) Air Flow Inputs (maybe calculated from velocity inputs).
d) Space temperature inputs.
e) Analog space temperature setpoint.
f) Binary unoccupied override inputs.
4) Operation modes supported by VAV Terminal Unit Controllers:
a) Daily/Weekly schedules.
b) Occupancy mode.
c) Unoccupied mode.
d) Temporary override mode.
b. Fan Coil Unit Controls:
1) Support, but limited to operational sequences described in Division 23.
2) Support the following input and output types:
a) Modulated heating and cooling control outputs.
b) Space temperature inputs.
c) Analog space temperature setpoint adjustment inputs.
d) Binary unoccupied override inputs.
3) Modes of operation supported by Fan Coil Unit Controllers:
a) Daily/weekly schedules.
b) Occupancy mode.
c) Unoccupied mode.
d) Temporary override mode.

2.8 ELECTRONIC CONTROL DEVICES

A. Temperature Sensors: Solid-state electronic, interchangeable with housing appropriate for application. Wall sensors: Install as indicated on drawings. Mount 48 inches above finished floor. Duct sensors: Install so sensing element is in the main air stream. Immersion sensors: Install in wells. Immersion wells to be filled with thermal compound before installation of immersion sensors. Outside air sensors: Install away from exhaust

or relief vents, not in an outside air intake, and in a shaded location.

B. Intelligent Room Sensor with Touchscreen:
1. General Requirements:
a. Backlit touchscreen LCD digital display.
b. Temperature sensor.
c. Humidity sensor.
d. Programmable Status Light indicator.
e. CO2 sensor or BACnet MS/TP communication up to 115.2 kbps.
f. Interact with smart sensor using a touchscreen, with no buttons allowed.
g. Tamper proof installation requiring tools to be removed from the wall.
h. Touchscreen: Surface hardness of Mohs 7 or greater preventing scratching.
i. Controller: Function as room control unit, and allow occupant to raise and lower setpoint, and activate terminal unit for override use-all within limits as programmed by building operator.
2. Space Temperature Sensor: Uni-Curve Type II thermistor. Accuracy: Plus or minus 0.36 degrees F (0.3 degrees C) at calibration point over range of 32 to 158 degrees F.
3. Humidity Sensor: Accuracy: Plus or minus 3 percent from 10 to 90 percent relative humidity (RH) or better, non-condensing.
4. Status Light indicator: A minimum of 4 colors, blue, red, amber, and green. Will cast a glow onto wall below sensor to be used as visual indicator to occupants of system condition. Color and on/off state of Status Light indicator to be fully programmable.
5. CO2 Sensor: Accuracy: Plus or minus 30 ppm over range of 0 to 5000 ppm.
a. Automatic Baseline Correction maintains calibration. No manual calibration.
6. Display Content:
a. Intelligent room sensor:
1) Simultaneously display room setpoint, room temperature, and outside temperature at each controller.
2) Ability to add or remove time-of-day, room humidity, and indoor air temperature to customize view for customer. Must have the capability to show temperatures in degrees Fahrenheit or degrees Celsius.
3) Display status of a lighting zone and control on/off state of zone from touchscreen using a tenant-accessible display page.
4) Display status of window zone (e.g., blinds) and control on/off state of zone from touchscreen using a tenant-accessible display page.
b. A communication loss or improper communications wiring to be displayed on the LCD screen to aid in trouble shooting.
c. Firmware version information to be displayable on the LCD screen.
d. Cleaning mode: Allow cleaning of touchscreen.
7. After Hours Override:
a. Be set and viewed in 30-minute increments.
b. Override countdown: Automatic but can be reset to zero by from the sensor.
c. The remaining time shall be displayed.
d. Display "OFF" in unoccupied mode unless a function button is pressed.

8. Configuration Modes:
    a. Intelligent Room Sensor: Service technician access to hidden functions for advanced system configuration. Functionality accessed-protected with a configurable PIN number.
    b. Field Service Mode shall allow access to common parameters as dictated by application's sequence of operations. Parameters shall be viewed and set from intelligent room sensor with no computer or other field service tool needed.
    c. If the intelligent room sensor is connected to VAV controller, Balance Mode shall allow a VAV box to be balanced and air flow parameters viewed. The balancing parameters shall be viewed and set from the intelligent room sensor with no computer or other field service tool needed.
9. Conformance: Intelligent Room Sensor to be in compliance of the following:
    a. UL Standard for Safety 916.
    b. FCC Part 15.107 and 109, Class B, CFR47-15.
    c. EMC Directive 89/336/EEC (European CE Mark).

2.9 INTERCONNECTING WIRE AND CABLE

A. Wiring regardless of service or voltage will comply with Contract Document Division 16 Project Electrical System Specifications, the National Electric Code (NEC), and any/all applicable local codes and/or Authorities Having Jurisdiction (AHJ).

B. Where required, wiring, regardless of service or voltage, shall be in conduit per Division 26 and routed parallel to or at right angles with the structure. Properly support every 6 ft.

C. Where permitted by local guides, NEC, AHJ, and approved by Engineer; use plenum-rated control cabling where final application will be concealed but accessible. Where plenum-rated cable is allowed, route parallel to or at right angles with the structure. Support every 6 ft.

D. The BAS Wiring:
1. 24 VAC Power: Red/Black jacketed conductors; black jacketed sheath over the pair.
2. Input/Output – White/Black jacketed conductors; white jacketed sheath over the pair.
3. Communication: White/Black jacketed conductors; blue jacketed sheath over the pair.

2.10 ELECTRONIC ACTUATORS AND VALVES

A. Quality Assurance for Actuators and Valves:
1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.
2. NEMA 2 rated enclosures for inside mounting. Weather shield for outside mounting.
3. Five-year manufacturer's warranty. Two-year unconditional and three-year product defect from date of installation.

B. Execution Details for Actuators and Valves:
1. Freeze-stat and "Hard Wire" interlock to disconnect mechanical spring return

actuator power circuit; fail-safe operation. Do not use control signals to drive actuators closed.

2. DDC analog output points to have an actuator feedback signal, independent of control signal, wired and terminated in control panel for true position information and troubleshooting. Or wire the actuator feedback signal to DDC as an analog input for true actuator position status.
3. VAV box damper actuation to be floating type or analog (2 to 10 VDC, 4 to 20 mA).
4. Booster-heat valve actuation to be floating type or analog (2 to 10 VDC, 4 to 20 ma).
5. Primary valve control shall be analog (2 to 10 VDC, 4 to 20 mA).

C. Actuators for damper and control valves 0.5 to 6 inches. Electric unless otherwise specified. Provide as follows:
1. UL Listed Standard 873 and Canadian Standards association Class 481302/
2. Enclosures: NEMA 2 rated for inside mounting. Weather shield for mounting outside.
3. Five-year manufacturer's warranty. Two-year unconditional and Three-year product defect from date of installation.
4. Mechanical Spring: When specified. Do not use non-mechanical fail-safes.
5. Position indicator device installed visible to exposed side of actuator. For damper short shaft mounting, provide a separate indicator to exposed side of actuator.
6. Overload Protection: Protection against burnout by using an internal current limiting circuit or digital motor rotation sensing circuit. Circuit to ensure actuators cannot burn out due to stalled damper or mechanical and electrical paralleling. End switches to deactivate actuator at end of rotation are acceptable for butterfly valve actuators.
7. A Pushbutton gearbox release shall be provided for non-spring actuators.
8. Modulating actuators shall be 24 VAC and consume 10 VA power or less.
9. Conduit connectors are required when specified and when code requires it.

D. Damper Actuators:
1. Outside air and exhaust air damper actuators: Mechanical spring return. Do not use non-mechanical forms of fail-safes. Mounting arrangement and spring return feature to permit normally open or normally closed positions of damper.
2. Economizer Actuators: Analog control 2-10 VDC. Floating control is not acceptable.
3. Electric damper actuators (and VAV box actuators): Direct shaft-mount. Use V-bolt and toothed V-clamp for positive gripping.
4. One electronic actuator direct shaft-mounted per damper section. No connecting rods or jackshafts. Small outside and return economizer dampers may be mechanically linked if one actuator has sufficient torque to drive both horizontal drive shafts.
5. Multi-section dampers with electric actuators shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft-mounted per damper section. (See below execution section for more installation details.)

E. Valve Actuators: 0.5 to 6 inches.
1. Mechanical spring on actuators for pre-heat coil and actuators for AHU heating or cooling coil for outside mounted units. Fail-safe flow function: Normal Open

or Normal Closed. Capacitors or non-mechanical forms of fail-safe are not acceptable.
2. Zone service actuators: Non-spring return unless otherwise specified.
3. Provide minimum torque required for proper valve close-off for required application.
4. Control valves actuators: Attached 3-foot cable for easy installation to a junction box.
5. Override handle and gearbox release for non-spring return valve actuators.

F. Control Dampers.
1. Furnish and size automatic control dampers unless provided with packaged equipment. Install dampers if not with packaged equipment.
2. Modulating Service: Opposed blade type. Arrange for normally open or closed operation. Size damper so when wide open, pressure drop is a sufficient amount of its close-off pressure drop for effective throttling.
3. Two-position or open-close control: Parallel blade type. Arrange for normally open or closed operation as required.
4. Alignment plates for multi-section dampers.
5. Linkage Hardware: Aluminum or corrosion-resistant zinc and nickel-plated steel.
   a. Bearing support bracket and drive blade pin extension for each damper section. Permanent indication of blade position by scratching or marking visible end of drive blade pin extension.
   b. Drive Pin: May be round if V-bolt and toothed V-clamp is used for positive gripping. For single bolt or set-screw type fastening, mill flat round damper pin to avoid slippage.

G. Control Valves: 0.5 - 6 inches.
1. Furnish specified motorized control valves, actuators, and control wiring to actuators. Equal percentage control characteristic for water coil control valves. Linear characteristic is acceptable for 3-way valves 2.5 inches and above.
2. Characterized Control Valves: For hydronic heating or cooling and small to medium AHU water-coil applications to 100 gpm. Actuators: Non-spring return for terminal unit coil control unless otherwise noted. If coil is exposed to outside air stream, see plans for spring return requirement.
   a. Leakage: 0 percent. Close-off: 200 psi. Differential: 30 psi. Rangeability: 500:1.
   b. Valves 0.5 to 2 inches: Nickel-plated forged brass body. NPT screw type connections.
   c. Valves 0.5 to 1.25 inches: ANSI Class 600 working pressure. Valves 1.5 and 2 inches: ANSI Class 400 working pressure.
   d. Operating Temperature Range: 0 to 250 degrees F.
   e. Stainless steel ball and stem furnished on modulating valves.
   f. Seats to be fiberglass reinforced Teflon.
   g. Two- and three-way valves: Equal percentage control port. Full stem rotation is required for maximum flow to insure stable BTU control of coil.
   h. Three-way valve to be applicable for both mixing and diverting.
   i. Characterizing Disc: TEFZEL; keyed and secured by retaining ring.
   j. Stem: Blow-out proof. Stem Packing: 2 lubricated O-rings for on-off or modulating service and to require no maintenance.

k. The valves shall have an ISO type, 4-bolt flange for mounting actuator in any orientation parallel or perpendicular to the pipe.
l. Non-metallic thermal isolation adapter. Separate valve flange from actuator.
m. One fastening screw shall secure the direct coupling of the thermal isolation adapter between the actuator and the valve. This will prevent lateral or rotational forces from affecting the stem and its packing O-rings.

3. Globe valves: 0.5 - 2 inches shall be used for steam control or water flow applications.
   a. Valves shall be bronze body, NPT screw type, and shall be rated for ANSI Class 250 working pressure.
   b. Valves 0.5 inches (DN15) through 2 inches (DN50) with spring return actuators shall close off against 50 psi pressure differential with Class III leakage (0.1 percent).
   c. The operating temperature range shall be 20-280 degrees F.
   d. Spring loaded TFE packing shall protect against leakage at the stem.
   e. Two-way valves shall have an equal percentage control port.
   f. Three-way valves shall have a linear control and bypass port.
   g. Mixing and diverting valves must be installed specific to the valve design.
4. Globe Valve: 2.5 to 6 inches (DN65 to DN50)
   a. Body: Iron body, 125 lb. flanged with Class III (0.1 percent) close-off leakage at 50 psi differential.
   b. Valves with spring return actuators shall close off against 50 psi pressure differential with Class III leakage (0.1 percent).
   c. Flow Type, 2-Way: Equal percentage. Flow Type 3-Way: Linear.
   d. Mixing and Diverting Valves: Installed specific to valve design.
5. Butterfly Valves: Sized for modulating service at 60 to 70-degree stem rotation.
   a. Isolation valves to be line-size. Design velocity: Less than 12 ft per second when used with standard EPDM seats.
   b. Body is cast iron.
   c. Disc is aluminum bronze standard.
   d. Seat is EPDM standard.
   e. Body Pressure is 200 psi, minus 30 to 275-degrees F.
   f. Flange is ANSI 125/250.
   g. Media Temperature Range is minus 22 to 240-degree F.
   h. Maximum Differential Pressure: 200 psi for 2 to 6 inches size.
6. Butterfly Valve Industrial Actuators:
   a. Approved under Canadian Standards Association or other Nationally Recognized Testing Laboratory to UL standards. CSA Class 4813 02 or equal. Enclosure: NEMA 4 (weatherproof) and have industrial quality coating.
   b. Continuous Duty Motor: Fractional horsepower; permanent split capacitor type designed to operate on a 120 VAC, 1 pH, 60 Hz supply. Provide two adjustable cam-actuated end travel limit switches controlling travel direction. Self-resetting thermal switch imbedded in motor for overload protection.
   c. Reduction gearing to withstand actual motor stall torque. Gears: Hardened alloy steel, permanently lubricated. Self-locking gear assembly or a brake.

d. Wire Harness: 6 ft for ease in field wiring (above 1500 in-lbs). Two adjustable SPDT cam-actuated auxiliary switches, rated at 250 VAC for indication of open and closed position.
e. Heater and thermostat to minimize condensation within actuator housing.
f. Hand Wheel: For manual override to operate valve during power failure or system malfunction. Permanently attached to actuator. When in manual operation electrical power to actuator must be permanently interrupted. Hand wheel will not rotate while actuator is electrically driven.
g. The actuator shall be analog, floating, or two position as called out in the control sequence of operation. Analog valves shall be positive positioning, and respond to a 2 to 10 VDC, 4 to 20 mA, or adjustable signal as required. Analog actuators shall have a digital control card allowing any voltage input for control and any DC voltage feedback signal for position indication.

7. Performance Verification Test:
   a. Control loops Cause productive actuation with each actuator movement. Actuators to modulate at rate that is stable and responsive. Actuator movement is not occur before effects of previous movement have affected sensor.
   b. Actuator to be capable of signaling a trouble alarm when actuator Stop-Go Ratio exceeds 30 percent.
   c. Actuator mounting for damper and valve arrangements; comply to the following:
   d. Damper actuators: Shall not be installed in the air stream
   e. A weather shield shall be used if actuators are located outside. For damper actuators, use clear plastic enclosure.
   f. Damper or valve actuator ambient temperature shall not exceed 122 degrees F through any combination of medium temperature or surrounding air. Appropriate air gaps, thermal isolation washers or spacers, standoff legs, or insulation shall be provided as necessary.
8. Actuator cords or conduit shall incorporate a drip leg if condensation is possible. Water shall not be allowed to contact actuator or internal parts. Location of conduits in temperatures dropping below dew point shall be avoided to prevent water from condensing in conduit and running into actuator.
9. Damper mounting arrangements: Comply to the following:
   a. Ventilation Subcontractor: Furnish/install damper channel supports and sheet metal collars.
   b. No jack shafting of damper sections shall be allowed.
   c. Multi-section dampers shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft mounted per section.
10. Size damper sections based on actuator manufacturer's specific recommendations for face velocity, differential pressure and damper type. In general:
    a. Damper section shall not exceed 24 ft-sq. with face velocity over 1500 FPM.
    b. Damper section shall not exceed 18 ft-sq. with face velocity over 2500 FPM.
    c. Damper section shall not exceed 13 ft-sq. with face velocity over 3000 FPM.
11. Multiple section dampers of two or more shall be arranged to allow actuators to

be direct shaft mounted on the outside of the duct.

12. Multiple section dampers of three or more sections wide to be arranged with a 3-sided vertical channel (WxD) 8 x 6 inches within duct or fan housing and between adjacent damper sections. Vertical channel to be anchored at top and bottom of fan housing or building structure for support. Sides of each damper frame to be connected to the channels. Holes in channel allow damper drive blade shafts to pass through channel for direct shaft-mounting of actuators. Face open side of channel downstream of airflow, except for exhaust air dampers.
13. Multiple Section Dampers: Mount flush within a wall or housing opening and receive vertical channel supports as described above or sheet metal standout collars. Sheet metal collars, 12 inches, must bring each damper section out of the wall to allow direct shaft-mounting of actuator on side of the collar.
14. Valve Sizing for Water Coil:
    a. On/Off control valves shall be line size.
    b. Modulating control valve body size may be reduced, at most, two pipe sizes from the line size or not less than half the pipe size. The BAS contractor shall size water coil control valves for the application as follows:
        1) Booster-heat valves shall be sized not to exceed 4-9 psi differential pressure. Size valve for 50 percent valve authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
        2) Primary valves: Sized not to exceed 5-15 psi differential pressure. Size valve for 50 percent valve authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
15. Butterfly valves: Size for modulating service; 60-70 degree rotation. Design velocity: 12 feet per second or less when used with standard EPDM seats.
    a. Valve mounting arrangements shall comply to the following:
        1) Unions shall be provided on ports of two-way and three-way valves.
        2) Install three-way equal percentage characterized control valves in a mixing configuration with the "A" port piped to the coil.
        3) Install 2.5 inches and above, three-way globe valves, as manufactured for mixing or diverting service to the coil.

2.11 ENCLOSURES

A. BAS Control equipment shall be provided and installed where shown on the associated HVAC Drawings and where needed for complete installation of BAS components. Coordinate mounting locations with other trades.

B. Controllers, power supplies and relays shall be mounted in enclosures. These items may also be mounted within the HVAC equipment control section if permitted by the HVAC equipment manufacturer, and if adequate space is provided.

C. Enclosures shall be designed for control and instrumentation applications, able to be mounted directly on the wall, and capable of adequately protecting the enclosed product in the environment in which it is mounted.

D. Enclosures shall not be mounted directly on HVAC equipment such as air handling unit

housings. Enclosures shall be pedestal base or wall mounted.

E. Enclosures: NEMA 1 or as required by location and local code requirements when located in a clean, dry, indoor environment. Indoor enclosures: NEMA 12 or as required by location and local code requirements when installed in other than a clean environment. Outdoor Enclosures and Enclosures in Wet Ambient Conditions: Weatherproof.

F. Control Enclosures: Hinged doors, key lock latch; single key

G. Laminated plastic nameplates, 0.125 inches thick, for enclosures in any mechanical room or electrical room. Place location and unit served on easy to read nameplate.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Carefully inspect installed work of other trades. Verify work is complete to where work of this Section may commence.

B. Do not proceed with installation until substrates have been prepared using methods recommended by manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect and Owner’s representative in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
   1. Install in conduit, wiring and cable, and install equipment in first-class manner, using proper tools, equipment, hangers, and supports, and in locations as required for a neat, attractive installations. No material shall be exposed if it is possible to conceal it. Exposed material shall be installed only with consent of the Engineer.
   2. Install the system as recommended by the manufacturer, using only equipment recommended or acceptable to the manufacturer.
   3. Support sensors as recommended by the manufacturer where inside equipment, such as ductwork. Sensors in the space shall be in small, attractive housings designed for that purpose and mounted on electrical junction box.
   4. Control tubing shall be supported at frequent intervals to support sagging. Tubing run in exposed areas shall be run in an inconspicuous manner following natural building lines. In finished portions of the building, tubing shall be run concealed.
   5. Use extreme care making connections to other equipment, such as boilers and chillers. Safeties of equipment are not to be by-passed or overridden by the BAS.
   6. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
   7. Install labels to identify control components.
   8. Provide equipment having moving parts and controlled by BAS with warning labels 2 inches in height, and in bright warning colors, stating equipment is

remotely started by automatic controls. Post labels clearly in area of moving parts, including but not limited to belts, fans and pumps.

9. VAV and Terminal Unit Controllers:
   a. Terminal unit controllers and actuators shall be factory mounted.
      1) Ship controller the terminal unit manufacturer for factory mounting.
      2) The Terminal Unit Manufacturer Shall:
         a) Mount the combination controller, actuator and differential pressure sensor package on the terminal units.
         b) Connect pressure sensing tubes to differential pressure sensor.
   b. At the HVAC contractors' option, the VAV terminal units maybe field mounted on the terminal units, in lieu of factory mounting. The HVAC contractor shall coordinate this work with the BAS Contractor and the Equipment Manufacturer.

3.3 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum 36 inches of clear access space in front of units. Obtain approval on locations from Owner's representative prior to installation.

B. Components including but not limited to instruments, switches, and transmitters; suitably wired and mounted to protect them from vibration, moisture, and high or low temperatures.

C. Identify equipment and panels. Provide permanently mounted tags for panels.

D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections and sized to suit pipe diameter without restricting flow.

3.4 INTERLOCKING AND CONTROL WIRING

A. Interlock and control wiring. Install wiring neatly and professionally, per Division 16 and national, state and local electrical codes.

B. Wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Shielded low capacitance wire for communications trunks.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of control equipment with the Owner's representative prior to rough-in.

D. Provide auxiliary pilot duty relays on motor starters as required for control function.

E. Provide power for control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate with electrical contractor.

F. Install control wiring in mechanical, electrical, telephone and boiler rooms in raceways. Install other wiring neatly and inconspicuously per local code. If code allows, control wiring above accessible ceiling spaces may be run with plenum-rated cable (without conduit).

3.5 SOFTWARE

A. Load and debug software for BAS. Operate to prove functionality of each system.
   1. Provide database generation.
   2. System displays: Show analog and binary object types within system; logically laid out for easy use by Owner. Provide outside air temperature indication on system displays associated with economizer cycles.
   3. At a minimum, run time totalization shall be incorporated for each monitored supply fan, return fan, exhaust fan, hot water and chilled water pumps. Warning limits for each point shall be entered for alarm and or maintenance purposes.
   4. Binary and analog object types (including zones) shall have the capability to be automatically trended.
   5. Analog inputs (High/Low Limits) and selected binary input alarm points to be prioritized and routed (locally or remotely) with alarm message per Owner's requirements.

B. BAS Contractor: Review programs with Engineer in the programming stage. Make sure programmer understands Engineer's intent and that program will carry out that intent.

C. Bound copy of the complete information on the equipment and components.

D. Spare parts list. Identify equipment critical to maintaining integrity of operating system.

3.6 SYSTEM DEMONSTRATION, VALIDATION AND ACCEPTANCE

A. Contractor will satisfactorily demonstrate operating sequence, daily and seasonal mode changes, and associated energy management routines for equipment controlled including:
   1. Hot water systems.
   2. Chilled water systems.
   3. Air handling units.
   4. Exhaust air systems.
   5. VAV terminal units.
   6. Miscellaneous Equipment: Including but not limited to the following.
      a. Ventilation systems.
      b. Cabinet heaters.
      c. Unit heaters.

B. Contractor to satisfactorily demonstrate proper operation of associated system points as defined in Division 15, including but not limited to:
   1. Analog input sensing device readings; temperature, humidity, pressure, flow, volume and CO2 sensors.
   2. Analog output controls; valves, dampers and speeds; including proper ranging.
   3. Binary input status readings.
   4. Binary output or two position controls; start/stops, open/closed, in/off.
   5. Pulsed inputs; flow meters, electric meters; including proper ranging.

C. Upon Completion of Work:
1. Demonstrate complete operating system to Owner's representative.
2. Certificate stating control system has been tested and adjusted for proper operation.

3.7 TRAINING

A. By BAS manufacturer. Utilize manuals, as-built documentation and on-line help utility.

B. Operator Training: Sixteen (16) hours encompassing, but not limited to the following topics.
1. Sequence of operation review.
2. Log in, log out.
3. Password assignment and modification.
4. Operator privileges assignment and modification.
5. Selection of displays and reports.
6. Commanding of points, including disable/enable.
7. Use of dialog boxes and menus.
8. Modifying warning limits, alarm limits and start-stop times.
9. Modification of color graphic displays.
10. Modification of alarm and status descriptors.
11. System initialization.
12. Backup, download and initialization of DDC in controllers.
13. Request and viewing of trend logs.
14. Archive and purge of historical data.
15. System maintenance procedures.

C. Programmer Training: Eight (8) hours encompassing but not limited to the following topics.
1. Software review of sequence of operation.
2. Use of programming tool and any additional plug-ins.
3. Modification of control programs, including Building Controller, Advanced Application and Application Specific programs.
4. Add, modify and delete data points.
5. Use of diagnostics.
6. System maintenance procedures.
7. Review of initialization.
8. Upload/download and off-line archiving of system software.
9. Creating and modifying color graphics
10. Operator training performed on site/off site. Coordinate dates/times with Owner.
11. Tuition for at least one individual to attend a one-week factory training class. If applicable, costs for travel, lodging and meals will be responsibility of Owner.
12. Printed training material provided by Contractor to training event attendees.

3.8 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer’s Services: Coordinate manufacturer’s services in accordance with appropriate sections in Division 01.

3.9 CLEANING AND PROTECTION

A. Clean and protect products in accordance with the manufacturer's recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 25 1100

ELECTRICAL CONTROLS AND INTERLOCKS

PART 1 – GENERAL

1.1 Conform with applicable provisions of the General Conditions, Supplementary Conditions and General Requirements.

1.2 RELATED WORK IN OTHER SECTIONS

260500 - GENERAL ELECTRICAL PROVISIONS
260519 – LOW VOLTAGE CONDUCTORS
260526 - GROUNDING
260533 - RACEWAYS, BOXES AND FITTINGS
262726 - WIRING DEVICES AND PLATES

1.3 DESCRIPTION OF WORK

A. All disconnect means, motor controllers, electrical controls, protective, and signal devices for equipment furnished under Division 25 of these specifications will be installed and connected as scheduled herein or as otherwise noted on the drawings.

B. Electrical items not shown on the electrical drawings, but which are required for equipment furnished under Division 25 of this specification shall be furnished under this section of the specifications and shall be installed and electrically connected in conformance with Division 26 Specifications.

1.4 SUBMITTALS

A. Submittal data for each individual electrically controlled item of equipment or device furnished under this Division of these specifications shall include complete electrical wiring diagrams, and elementary control diagrams (ladder form) showing all internal and external wiring connections and services. The submittal data shall itemize all electrical characteristics that are of a special nature or critical to the electrical installation or control system. Such equipment and devices will not be considered for approval until these requirements are met. These submittals shall form a part Section 250500 requirements and shall be properly coordinated by the Contractor.

B. As soon as possible after contract notice to proceed, one print of the ladder diagrams shall be submitted by the contractor showing all necessary wiring for the mechanical equipment and devices proposed for installation. This print shall be reviewed and approved by the contractor, and then submitted to the Architect/Engineer for approval. The print shall indicate all components which shall be wired to the control/power circuits by the contractor, with all terminals for external connections of the components identified and labeled to correspond to the manufacturer's designations. Internal or factory installed wiring of package-type components need not be shown. Control diagrams shall show all internal and external wiring connection and shall clearly indicate field wiring furnished and installed under Division 25, differentiated from field wiring furnished and installed under Division 26.

C. Revised Drawings: After the Architect/Engineer has approved the marked copy of the control diagrams submitted in accordance with Paragraph B above, the Contractor shall issue prints to all involved parties. The control diagrams shall be certified in writing as being acceptable to the contractor. The approved drawings will then be included in the control submittal and the Operating and Maintenance Manual.

1.5 INSTALLATION

A. No control work shall be performed until control submittal has been approved by the Architect/Engineer.

1.6 CHANGES DURING CONSTRUCTION

A. The complete responsibility and costs for revisions during construction to the approved control diagrams, and the resultant changes to the installation requirements, not covered by contract change order, shall be assigned to the contractor requesting such revisions.

PART 2 – PRODUCTS

2.1 CONTROL AND INTERPOSING RELAYS

A. Relays other than those on I/O cards shall be general purpose, enclosed plug-in type with 8 pin octal plug and protected by a heat and shock resistant dust cover. Relays shall be of the Neon or LED indicator type.

B. Relay contact configuration and ratings shall be for rated load voltage and exceed load current rating by no less than fifty percent. Minimum contact rating shall be 10 amps at 120 volts AC.

2.2 TERMINAL STRIPS

A. Terminal strips shall be of the molded nylon or polypropylene barrier type, individual plug-in mounted on a mounting channel. Terminal connections shall be rated 300 volt, 40 amp and shall be of the tubular clamp type for use with bare wire ends, or of the strap screw type for use with crimp spade lug prepared wire ends. Terminal strips shall provide for removable marking strips or have prepainted matte finish marking surfaces. Buchanan 600 series or approved substitute.

PART 3 – EXECUTION

3.1 RELAYS

A. All remote field devices shall be controlled through the use of an interposing relay. In no case shall a contactor or motor starter be directly controlled from a solid state device output or relay contact of a rating less than that stated above.

3.2 COMPONENT IDENTIFICATION

A. All individual components (relays, timers, terminal strips, etc.) shall be clearly marked with the identification nomenclature shown on the manufacturer's shop drawings.

Identification shall be by the use of press-type tape strip (kroy) covered with Scotch 600 clear tape or approved substitute method.

3.3 CONTROL WIRING INSTALLATION

A. The installation and wiring of all electrical equipment installed under this contract shall meet all Electrical Division specifications. Special attention is called to the following:
   1. All wiring to be in conduit.
   2. All control wiring to be color-coded throughout. Conductor color shall be consistent for the entire length of circuit.
   3. All splices shall be made in junction boxes on terminal strips.
   4. All control wiring to terminate on marked terminal strips and shall be marked at all terminal points. Both ends of each wire shall be marked with a designation shown on the manufacturer's shop drawings, using interlocking chevron shaped snap-on plastic markers, hot-marked shrinkable tubing, hot stamping of the wire, or clear shrink-on tubing securing adhesive labels. Markers which depend solely on adhesive are not acceptable.

END OF SECTION

SECTION 25 3000

CONTROLS AND INSTRUMENTATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish and install a control system, complete in all respects to provide the Sequence of Control shown on the drawings.

B. All disconnect means, motor controllers, and all protective and signal devices for all electrical equipment provided under all Electrical Divisions will be furnished, installed and connected under all Electrical Divisions with the following exceptions:
   1. All controls wiring and conduit for HVAC equipment is the complete responsibility of all Mechanical Divisions. Electrical connections, relays, interlocks, etc. not shown on the electrical drawings, but which are required for equipment furnished under all Mechanical Divisions shall be installed and electrically connected by all Mechanical Divisions in conformance with all Electrical Division Specifications.
   2. All disconnect means, motor controllers, and all protective and signal devices furnished with, mounted on and connected integral with equipment furnished under other divisions.
   3. All disconnect means, motor controllers, electrical controls, protective, and signal devices for equipment furnished under all Mechanical Divisions of these specifications will be installed and connected as scheduled herein or as otherwise noted on the drawings.

C. The mechanical trade is entirely responsible for furnishing, installing, wiring, connecting and placing the control systems in operation. Electrical work required will be the final responsibility of the Mechanical Contractor either by his own electricians or by his subcontract with an Electrical Contractor.

1.3 RELATED WORK IN OTHER SECTIONS

230593 - BALANCING OF MECHANICAL SYSTEMS
250000 - INTEGRATED AUTOMATION INDEX
250500 - GENERAL INTEGRATED AUTOMATION REQUIREMENTS

1.4 GENERAL REQUIREMENTS

A. The control system shall be furnished complete for the heating and air conditioning systems by Alteron, Invensys (Siebe), Delta, TAC (Andover), and Honeywell. The temperature control company shall have a permanent, fully staffed, well-established, local office and service organization. A complete stock of all repair and replacement

parts for all items furnished under this contract shall be carried in stock at the local office at all times.

B. Submittals: Shall include plan size drawings, with individual literature on each item, showing control sequences, complete electrical ladder diagrams and all control components and their wiring requirements. The Contractor shall be responsible to see that all systems are properly coordinated.

C. Operation and Maintenance Manuals: As soon as possible after Award of Contract, the Contractor shall prepare an Operation and Maintenance (O & M) Manual and submit it to the Engineer for review and approval. The control system testing and training specified hereafter shall not be conducted until the O & M Manual has been approved. See Specification Section 251000 – Direct Digital Control Software and Components. The Manual shall contain, as a minimum:

1. Approved control diagrams.
2. Equipment and device catalog cuts identifying each control device with a unique number or symbol coordinated with the control diagram symbols.
3. A Sequence of Control for each system's control diagram identifying the function and physical location of each adjustable control device, written in language understandable to personnel not specifically trained in HVAC control systems.
4. A Troubleshooting section for each control system indicating what tests and/or adjustments can be made to identify and/or correct common problems with control systems of the type installed. This description should address procedures to determine the cause of high or low space temperature and/or humidity in a typical room served by each air handling system. The description should be adequate to lead untrained persons to conclude, at minimum, whether the unit is receiving adequate primary cooling or heating, whether mixed air and supply air temperatures are reasonable and whether field adjustments or technical service is required to solve the problem. This troubleshooting section shall be bound in a separate section of O & M Manual and shall clearly refer to control device symbols shown on the Control Diagram drawings.

1.5 SPECIAL REQUIREMENTS

A. The controls trade shall check and adjust his control system completely, four (4) times during the warranty period. The fourth (4) check to be made during the final thirty days of the warranty period.

B. The controls trade will furnish the Owner with an accurate, up-to-date wiring diagram of all electrical and electronic equipment installed under this contract.

C. The Contractor shall furnish a complete set of parts lists, operating instructions and maintenance literature, in duplicate, for proper maintenance of all control equipment.

D. Steel lockable covers shall be provided for all space thermostats where shown on the drawings and where the space thermostat could be damaged.

PART 2 – PRODUCTS

2.1 CONTROL AND INTERPOSING RELAYS

A. Relays other than those on I/O cards shall be general purpose, enclosed plug-in type with 8 pin octal plug and protected by a heat and shock resistant dust cover. Relays shall be of the Neon or LED indicator type.

B. Relay contact configuration and ratings shall be for rated load voltage and exceed load current rating by no less than fifty percent. Minimum contact rating shall be 10 amps at 120 volts AC.

2.2 TERMINAL STRIPS

A. Terminal strips shall be individual plug-in type on a mounting channel. Terminal connections shall be rated 300 volt, 40 amp and shall be of the tubular clamp type for use with bare wire ends, or of the strap screw type for use with crimp spade lug prepared wire ends. Buchanan 600 series or approved substitute.

2.3 AUTOMATIC DAMPERS

A. All automatic dampers shall be furnished by the controls trade and shall be constructed of galvanized sheet steel with bushings made of oil impregnated sintered bronze to give constant lubrication. Each damper section shall have positive closing neoprene blade and edge seals. Outside air, return air and relief dampers shall have blades designed so that the blades are interconnected to give parallel movement. Each modulating damper shall provide a near linear relationship between damper opening and airflow. All volume dampers shall have opposed blades, which will produce equal pressure drop flow characteristics. Blade width shall not exceed 6 inches.

2.4 AUTOMATIC CONTROL VALVES – ELECTRIC

A. The controls trade shall provide all automatic control valves and shall be made by the control manufacturer. All electric control valves 2" and smaller in size shall be brass body and trim, 2-1/2" and larger shall be iron body with brass or stainless steel trim. Valves shall be provided with renewable type seats and adjustable springs. Valves shall be designed to pass the quantity of water and with a maximum pressure loss not to exceed 10 ft. Valves shall be provided with "V" port or throttling type seat. Valves 2" or smaller shall be screwed. Valves 2-1/2" and larger shall be flanged. All sequencing valves shall have positive positioners.

2.5 DAMPER MOTORS – ELECTRIC

A. The damper motor shall be electro-hydraulic type capable of providing full proportional control of dampers. The actuator shall be compatible with any low voltage controller or auxiliary device. One motor shall be provided per damper section.

2.6 CONTROL PANELS

A. An enclosed control panel or panels with hinged door and locking device shall be installed where shown on the drawings. Panel layout shall be as shown. Thermometers

switches and pilot lights will be flush mounted on the hinged door. Hard tubing shall be brought into the panel. Tubing within the panel may be plastic neatly bundled and tagged. All indicators and controllers will have descriptive bakelite tags.

2.7 FILTER GAUGES

A. Shall be furnished and installed in each filter bank located in the Mechanical Room and at each rooftop air handling unit. Gauges shall be Dwyer Magnahelic with static pressure tips and interconnecting tubing. Range shall be approximately 1-1/2 times the nominal filter change out pressure differential. Each rooftop filter bank shall also have a differential pressure switch with indicator lamp located on a control panel in the Mechanical Room to indicate filter replacement pressure differential has been exceeded.

2.8 SMOKE AND FIRE DETECTORS

A. Smoke detectors shall be furnished and installed in each air handling unit or system and detectors shall be furnished by the Division 26 Contractor, installed by the Division 25 Contractor, connected and tested by the Division 26 Contractor.

2.9 SEQUENCE OF OPERATION

A. The operation of the control system shall be as indicated on the drawings and control diagrams. The sequence shall be rewritten and shown on the control submittal drawing diagramming that system. The sequence on the submittal drawing shall identify control devices by number and physical location coordinated with the submittal drawing device numbers.

PART 3 – EXECUTION

3.1 RELAYS

A. All remote field devices shall be controlled through the use of an interposing relay.

3.2 INSTALLATION

A. No control work shall be performed until the control system shop drawings have been approved by the Engineer and returned to the contractor.

3.3 CONTROL WIRING

A. The installation and wiring of all electrical equipment installed under this contract shall meet all Division 16 specifications. Special attention is called to the following:
   1. All wiring to be in conduit.
   2. All control wiring to be color-coded throughout. Conductor color shall be consistent for the entire length of circuit.
   3. All splices shall be made in junction boxes on terminal strips.
   4. All control wiring to terminate on marked terminal strips and shall be marked at all terminal points. Both ends of each wire shall be marked with a designation shown on the manufacturer's shop drawings, using interlocking chevron shaped snap-on plastic markers, hot-marked shrinkable tubing, hot stamping of the wire,

or clear shrink-on tubing securing adhesive labels. Markers which depend solely on adhesive are not acceptable.

B. Terminal strips shall be used in all boxes and cabinets where more than six control wires are terminated, spliced or both.

C. All control wiring shall be color coded and marked in each box, at each termination with Brady wrap around labels or suitable tags approved by the Architect. The schematic control diagrams shown on the contract drawings are for the convenience of the contractor and may not be complete in all details of control wiring for the equipment purchased for installation.

3.4 SYSTEM TESTING

A. The integrity and accuracy of each function and control point shall be demonstrated to the satisfaction of the Architect/Engineer during the test period. At the termination of the testing period the Contractor shall spend one working day instructing the Owner or his designated personnel in the control system operation. A complete operating booklet shall be provided and used during the training period.

B. Upon completion of the installation, the Contractor or his authorized representative shall be sent to the installation to certify that all necessary electrical tests and control adjustments have been completed. He shall then file a letter of Certification indicating that the system functions and conforms to the intent of these specifications.

END OF SECTION

SECTION 25 6000

MECHANICAL AND ELECTRICAL COORDINATION SCHEDULE

PART 1 – GENERAL

1.1 REQUIREMENTS:

A. Conform with applicable provisions of the General Conditions, Supplementary Conditions and General Requirements.

B. It is the responsibility of the Contractor to carefully coordinate all trades to provide a complete and operational system that conforms to the contract documents.

1.2 DEFINITIONS

A. "Furnished by" shall mean that the materials, equipment, wiring, etc. shall be provided to the project by the noted contractor unless specifically noted otherwise in the contract documents.

B. "Install by" shall mean that the materials, equipment, wiring, labor, etc. shall be installed (mounted in field) at coordinated locations for complete system and shall be completed by the noted contractor unless specifically noted otherwise in the contract documents.

C. "Control wiring" shall mean that the controls wiring including all supports connections, etc. shall be installed complete by Contractor noted unless specifically noted otherwise in the contract documents.

D. "Power wiring" shall mean that the power wiring including all supports connections, etc. shall be installed complete by the Contractor noted unless specifically noted otherwise in the contract documents.

E. "Connected by" shall mean that all required materials and labor shall be provided to and for the complete installation of all devices and equipment and shall be completed by the noted contractor unless specifically noted otherwise on the contract documents.

1.3 **SCOPE:** Make all connections to motors and controls for equipment furnished and/or installed under Mechanical and Electrical Specifications according to the following schedule unless otherwise noted on the contract documents:

Item	Furnished By	Installed By	Control Wiring By	Power Wiring By	Connected By
Fire/Smoke Dampers	Div. 23	Div. 23			
Fire/Smoke Dampers Linkages	Div. 23	Div. 23			
Fire/Smoke Dampers Actuators/Smoke Detectors	Div. 23	Div. 23	Div. 28 (d)	Div. 28 (e)	Div. 28 (d)
Fire Alarm Panel and Interfacing with A/C Systems	Div. 28 (d)	Div. 28 (d)	Div. 28 (d)	Div. 28 (d)	Div. 28 (d)
Hydronic Valves	Div. 25	Div. 25			
Item	Furnished	Installed	Control	Power	Connected

	By	By	Wiring By	Wiring By	By
Hydronic Valves Actuators	Div. 25	Div. 25	Div. 25	Div. 26(e)	Div. 25
Flow Control Regulators	Div. 25	Div. 25	Div. 25	Div. 26(e)	Div. 25
Duct Smoke Detectors	Div. 25	Div. 25	Div. 28 (d)	Div. 26 (d)	Div. 28 (d)
Volume Control Dampers	Div. 23	Div. 23			
Volume Control Dampers Linkages	Div. 23	Div. 23			
Volume Control Dampers Actuators	Div. 23	Div. 23	Div. 23		Div. 23
120V Thermostat Backboxes & Wall Conduit	Div. 26	Div. 26			
DDC Electronic Thermostats	Div. 25	Div. 25	Div. 25		Div. 25
DDC Terminal Controls	Div. 25	Div. 25	Div. 25	Div. 26 (b)	Div. 25
DDC Zone Control Panels	Div. 25	Div. 25	Div. 25	Div. 26 (b)	Div. 25
DDC Backboxes and Cabinets	Div. 25	Div. 16			
Non-DDC Control Relays	Div. 25	Div. 25	Div. 26	Div. 25	Div. 25
Non-DDC Thermostats, Time	Div. 25	Div. 25	Div. 26	Div. 25	Div. 25
Non-DDC Control Transformers	Div. 25	Div. 25	Div. 25	Div. 26 (e)	Div. 25
HVAC Instrumentation (electronic temperature sensors, etc.)	Div. 25	Div. 25	Div. 25	Div. 26 (e)	Div. 25
Equipment Motors	Div. 23	Div. 23	Div. 26	Div. 26	Div. 26
Motor Control Centers with Starters, Overload Heaters, H-O-A Switches, Pilot Lights, Push Buttons, etc.	Div. 26	Div. 26	Div. 26	Div. 26	Div. 26
Motor Starters & Overload Heaters Outside Motor Control Centers	Div. 26	Div. 26	Div. 26	Div. 26	Div. 26
Fused & Unfused Disconnect Switches Thermal Overload & Heaters	Div. 26	Div. 26	Div. 26	Div. 26	Div. 26
Manual Operating & Multispeed Switches Switches (Low Voltage – Less than Line Voltage	Div. 26	Div. 26	Div. 26	Div. 26	Div. 26
Pushbutton Stations & Pilot Lights	Div. 26	Div. 26	Div. 25	Div. 26	Div. 26
Fire Protection Sprinkler System Control Supervisory Panels and Devices O.S.0.&Y. Switch, Flow Switch	Div. 21	Div. 21	Div. 28 (d)	Div. 26	Div. 28 (d)
Heat Taping for Mechanical Systems	Div. 23	Div. 23	Div. 23	Div. 26 (e)	Div. 26 (e)
Variable Frequency Drives	Div. 23	Div. 26	Div. 23	Div. 26	Div. 26
Heat Tape for Roof drains or Gutters	Div. 26	Div. 26	Div. 26	Div. 26	Div. 26

Table Notes:

a) Unless specified to be furnished under Division 25 by the equipment supplier.

b) A dedicated isolated power circuit to Direct Digital Controls (DDC) Central Control Station shall be furnished and installed under Division 26.

c) Smoke damper EP’s and pneumatic actuators shall be wired into the fire alarm system Division 28.

d) Performed by the Fire Alarm Sub-Contractor Division 28

e) 120V connections by Div. 26

1.4 SUBSTITUTIONS

If the substitution of equipment, devices, or systems furnished under this Division result in changes to the Contract Drawings, Specifications and/or changes to the installation requirements, the complete responsibility and costs shall be assigned to the section of these Specifications under which the equipment is furnished with no additional costs to the Owner.

1.5 SUBMITTALS

In conjunction with the temperature control, Fire Extinguishing System, and DDC submittals, complete submittal data for each individual Electrically operated or Electrically controlled item of equipment or device furnished under this Division of these Specifications shall include Electrical wiring diagrams and elementary control diagrams (ladder form) showing all internal and external wiring connections and services and shall clearly indicate field wiring furnished and installed under Division 25, differentiated from field wiring furnished and installed under Division 26. The submittal data shall itemize all Electrical characteristics that are of a special nature or critical to the Electrical installation or control system. Such equipment and devices will not be considered for approval until these requirements are met. All submittal data shall be reviewed and approved by the General Contractor, Mechanical, Electrical and Controls Sub-Contractors prior to submission of the complete Temperature Control, Fire Extinguishing System and DDC submittal to the Architect. The submittals shall indicate all components that are to be wired into the control power circuit by the Electrical Sub-Contractor, with all terminals for external connections of the components identified and labeled to correspond to the manufacturer's designations. Internal or factory installed wiring of package-type components need not be shown. The Shop Drawings for the system to be installed by the Temperature Controls, Fire Extinguishing System and DDC Sub-Contractors shall be prepared as complete submittals including all wiring requirements as described herein. Color coding designations shall be indicated for the control power circuit wiring.

PART 2 – PRODUCTS

2.1 REQUIREMENTS

The materials, equipment, and devices related to the Electrical System controls are specified under other sections of these Specifications.

PART 3 – EXECUTION

3.1 CHANGES DURING CONSTRUCTION

A. The complete responsibility and costs for revision during construction arising as a result of equipment substitutions, and any resultant changes to the installation requirements, shall be assigned to the respective section of these Specifications, under which the equipment is furnished at no additional costs to the Owner.

B. In the event of conflict in the delineation of responsibilities for the furnishing and installation of items of Mechanical equipment and the associated control and interlock wiring between Division 26, Division 25 shall provide all required material, labor, etc., to complete the work as shown in the contract documents.

3.2 INSTALLATION

No control work shall be performed until the reviewed and marked submittal data have been reissued to the Contractor, unless written permission is obtained from the Architect.

END OF SECTION

SECTION 26 0000

ELECTRICAL INDEX

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish all service tools, equipment, etc., which are required for the complete installation of all Electrical Work, as indicated on the Drawings and specified herein. Electrical work indicated on the Drawings and/or specifications covering other trades shall conform to Division 26 of these Specifications.

B. Work or equipment not indicated or specified, which is necessary for the complete and proper operation of the Electrical systems, shall be accomplished without additional cost to the Owner.

C. Furnish all labor and materials required for electrical service and control connections to all the various items of equipment requiring electric or wiring service throughout the project shown on the Contract Drawings (even if not shown on the Electrical Drawings). Coordinate with other trades for the installation of required connections and service.

1.3 ELECTRICAL DIVISION INDEX

260500 GENERAL ELECTRICAL PROVISIONS
260519 LOW VOLTAGE CONDUCTORS
260526 GROUNDING
260533 RACEWAYS, BOXES AND FITTINGS
260536 CABLE TRAY
260553 IDENTIFICATIONS FOR ELECTRICAL SYSTEMS
262416 PANELBOARDS
262716 CABINETS
262726 WIRING DEVICES AND PLATES
262800 MOTOR AND CIRCUIT DISCONNECTS
262810 MECHANICAL AND ELECTRICAL COORDIANTION SCHEDULE
262813 FUSES
263213 ENGINE GENERATORS
263600 TRANSFER SWITCHES
264300 SURGE SUPPRESSION PROTECTION DEVICES
265119 LED INTERIOR LIGHTING

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

SECTION 26 0500

GENERAL ELECTRICAL PROVISIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 REQUIREMENTS OF REGULATORY AGENCIES AND STANDARDS

A. Regulatory Agencies: Installation, materials, equipment and workmanship shall conform to the applicable provisions of the National Electrical Code (NEC), the National Electrical Safety Code (NESC), Occupational Safety and Health Act (OSHA) all local, state and national codes, ordinances and regulations governing the particular class of work involved and the terms and conditions of the electrical utility and other authorities having lawful jurisdiction pertaining to the work required. All modifications required by these codes, rules, regulations and authorities shall be made by the Contractor without additional charge to the Owner. The Contractor shall secure all permits and licenses required for his work and shall pay all fees in connection with such permits and licenses.

B. On completion of the various parts of the work, the installation shall be tested by the constituted authorities and approved; and, on completion of the work, the Contractor shall obtain and deliver to the Owner, final certificates of acceptance. The Contractor shall furnish copies of each certificate to the Architect/Engineer.

C. Underwriter's Laboratories (UL): All materials, appliances, equipment or devices shall conform to the applicable standards of Underwriter's Laboratories, Inc. where such standards have been established.

D. Standards: The current edition of the following specifications and standards shall form a part of these specifications:

1. National Fire Protection Association Standards
2. National Electrical Code, NFPA 70 (NEC)
3. Life Safety Code, NFPA 101
4. NFPA 72
5. Occupational Safety and Health Act (OSHA)
6. National Electrical Safety Code (NESC)
7. Underwriter's Laboratories, Inc. (Standards)
8. American National Standards Institute (ANSI)
9. American Society of Testing and Materials (ASTM)
10. Institute of Electrical and Electronic Engineers (IEEE)
11. Insulated Cable Engineer's Association (ICEA)
12. National Electrical Manufacturer's Association (NEMA)
13. Americans with disabilities Act Accessibility Guidelines (ADA)

1.3 DRAWINGS

A. The electrical drawings show the general arrangement of all conduit, outlets, equipment, etc. and shall be followed as closely as actual building construction and the work of other trades will permit. The architectural and structural drawings shall be considered as a part of the work insofar as these drawings furnish the Contractor with information relating to the design and construction of the building. Architectural drawings shall take precedence over electrical drawings. Because of the small scale of the electrical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, elbow, pullboxes, and accessories as may be required to meet such conditions.

B. The Contractor shall verify the dimensions governing the electrical work at the building. No extra compensation shall be claimed or allowed because of differences between actual dimensions and those indicated on the drawings.

C. Drawings and specifications shall be considered as complementary. Work or materials called for by one and not mentioned in other shall be provided as though treated by both.

D. In the case of conflict between drawings and specifications, the greater or more restrictive requirement shall apply.

E. Any question as to the intent of the drawings or specifications shall be referred to the Architect/Engineer, whose decision shall be final and conclusive.

F. Should the Contractor observe any conflict or variation in the plans and specifications, he shall notify the Architect/Engineer in writing no later than seven (7) days prior to date of bid opening. Failure to clarify such variations will result in the Contractor bearing all costs arising from electrical work necessary to resolve the conflict or variation.

1.4 SERVICES

A. General: Requirements of the serving power and telephone utilities and availability of services have been determined as accurately as possible. The Contractor shall verify availability of services and determine actual details pertaining to the exact locations and requirements of utilities before submitting bid. No consideration for extra cost will be given resulting from failure to comply with these requirements by the Contractor. Contractor shall immediately notify the serving utilities that he has the job, and also furnish information as to the total lighting and power loads for the job. He shall also furnish, at the same time, information as to the established completion date of the job.

B. Telephone: Contractor shall immediately notify the serving utility of the estimated date when service will be desired.

1.5 AS-BUILT DRAWINGS

A. During progress of the work, the contractor shall maintain an accurate record of the installation of the system, locating each outlet, and note all circuiting deviations from the contract drawings. Upon completion of the installation, the contractor shall transfer all record data to a single neat and legible set of blue line prints of the original drawings.

1.6 OPERATING INSTRUCTIONS AND MANUALS

A. Instructions: Without additional charge to the Owner, furnish competent instruction to the Owner in the care, adjustment and operation of all parts of the electrical equipment and systems.

B. Manuals: Upon completion of the work, prepare and deliver to the Owner two (2) sets of complete operating and maintenance manuals for the systems and major equipment installed, suitably bound in book form and must be originals. Include catalog data, shop drawings, wiring diagrams, performance curves and rating data, spare parts lists and manufacturer's operating and maintenance data.

C. Other: The above requirements are in addition to specific instructions and manuals specified for individual systems or equipment.

1.7 SITE VISIT

A. The Contractor shall visit the site prior to bidding and satisfy himself as to the conditions under which the systems are to be installed. No subsequent allowance shall be made in his behalf for failure to make such a visit.

1.8 FIELD MEASUREMENTS

A. The Contractor shall verify the dimensions covering the work. No extra compensation shall be claimed or allowed due to difference between actual dimensions and those indicated on the drawings. No waiver of responsibility for defective work shall be claimed or allowed due to failure to report unfavorable work conditions affecting the work.

1.9 PERFORMANCE TESTS

A. Thoroughly test all fixtures, batteries, services and all circuits for proper operating condition, required durations and freedom from grounds and short circuits before acceptance is requested. All equipment, appliances and devices shall be operated under load conditions.

B. After the interior wiring system installation is complete and at such time as the Architect/Engineer may direct, conduct operating tests for approval. When requested, test all the wire, cable, devices and equipment after installation, to assure that all material continues to possess all the original characteristics as required by governing codes and standards listed in these specifications.

C. After occupancy of the building has taken place and nominal building power loads established, make voltage readings at all panelboards. Based on these readings, make final adjustments of taps on all transformers in the building as directed.

D. Perform such other tests as required by other sections of these specifications or as requested to prove acceptability.

E. Furnish all instruments and labor for testing.

1.10 REMODELING WORK

A. Where remodeling work is indicated, the Contractor shall be responsible for all electrical work associated with changes in, or removals of existing walls, ceilings or floors. This work shall include rerouting of conduits, relocation of fixtures, devices and conduits as well as provision for circuit continuity for circuits in remodeled areas. The cost of all of this work shall be included in the Contractor's price with no additional compensation allowed for failure to include this work.

1.11 MISCELLANEOUS ITEMS

A. Miscellaneous items not covered in these specifications shall be as indicated on the drawings, installed and connected in the proper manner and as recommended by the manufacturer.

1.12 GUARANTEE

A. All equipment and workmanship to be furnished under this contract shall be guaranteed for a period of one year from the date of final acceptance thereof against defective materials, design and workmanship. Upon receipt of notice from the Owner of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be replaced promptly with new parts by and at the expense of the Contractor. The labor incident to the installation of these replacements shall be furnished by the Contractor.

1.13 STANDARDS OF MATERIAL AND WORKMANSHIP

A. All material shall be new and shall bear the label of the Underwriter's Laboratories, Inc., or be listed under re-examination service. All material shall be of the best grade and latest pattern of manufacture as specified. All work shall be performed in a neat, workmanlike manner and shall present a neat mechanical appearance when completed.

PART 2 - PRODUCTS

2.1 EQUIPMENT REQUIREMENTS

A. The electrical requirements for equipment specified or indicated on the drawings are based on information available at the time of design. If equipment furnished for installation has electrical requirements other than indicated on the electrical drawings, the Contractor shall make all adjustments to wire and conduit size, controls, overcurrent protection and installation as required to accommodate the equipment supplied, without additional charge to the Owner. The complete responsibility and costs for such adjustments shall be assigned to the respective section of this specification under which the equipment is furnished.

2.2 MATERIALS

A. When the product of a specific manufacturer is indicated on the drawings or specified herein by catalog number or trade name, it has been done for convenience in fixing the standard for workmanship, finish, design and the guaranteed performance. Any material, apparatus or appliance which the Contractor desires to substitute for those mentioned

herein shall also conform to these standards or exceed them and shall follow the procedure as outlined under substitutions and specified herein.

B. All similar materials and equipment shall be the product of the same manufacturer.

C. Where no specific material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be used, providing it conforms to the contract requirements and meets the approval of the Architect/Engineer.

D. Materials and equipment shall be the standard products of manufacturers regularly engaged in the production of such material and shall be the manufacturer's current and standard design.

E. Altitude: Equipment affected by altitude shall perform satisfactorily for the function intended at the altitude of the project site.

2.3 NAMEPLATES

A. All items of mechanical and electrical equipment shall be identified by the attachment of engraved nameplates, constructed from laminated phenolic plastic, at least 1/16" thick, three-ply, black surface and white core. Plates shall be attached using stainless plate screws unless indicated otherwise. Nomenclature on the label shall include the name of the item and feeder circuit number. Equipment to be labeled shall include, but not be limited to, the following:

1. Air Conditioning Control
2. Contactors
3. Panels and Switches
4. Time Switches
5. Relays
6. Disconnect Switches
7. Starters
8. Transformers
9. Miscellaneous
10. Similar and/or related items

2.4 IDENTIFICATION AND SIGNS

A. Label each individual motor controller, disconnect switch, transformer and remote control device to identify each item and its respective service.

B. Provide nameplates with engraved lettering not less than 3/8 inch high where specified or noted. In general, use white core laminated plastic, attached with screws. Embossed plastic adhesive tape is not acceptable. Flush mounted devices may have identification engraved in the device plate.

C. Provide warning signs on all equipment or devices operating at 300 volts or more, reading “DANGER - 480 VOLTS” (insert respective voltage) etc., with white letters on red background of standard code size. Signs may be decals, stencils or nameplates.

D. Identify panelboards and cabinets by nameplates with descriptions indicated on the drawings together with voltage and phase. Install on outside of hinged doors of panelboards and cabinets.

2.5 CHANGES

A. No changes shall be made in the electrical work as shown and herein specified, unless such changes are authorized in writing by the Architect/Engineer and such authorization shall contain a statement covering the amount of the charges involved in the change.

2.6 SUBSTITUTIONS

A. On all material, substitutions will be considered only if requested by letter from the Contractor to the Architect/Engineer. Letters must be in the engineer's office no later than 10 days prior to the bid date and shall be considered as authorized only upon written confirmation from the Architect/Engineer. Where materials are proposed to be substituted in lieu of the items specified, substitutions shall be equal in quality, workmanship and design. The burden of proof of equality of materials shall be placed upon the Contractor. Samples of all materials proposed for substitution shall be submitted to the Architect/Engineer, when requested, for examination.

2.7 SHOP DRAWINGS

A. Shop drawings shall be furnished for all equipment and materials. They shall be furnished by the Contractor as required in the Submittal Section. Where equipment will be furnished "as specified," a statement to that effect is sufficient. Where substitutions are proposed, complete data must be furnished showing performance, quality and dimensions.

B. The Contractor shall submit to the Architect/Engineer for checking a complete descriptive and technical data list for all items of material furnished under this contract. Complete outlines, dimensions, electrical services, control diagrams, electrical characteristics of special nature or critical to the installation and pertinent data required for installation shall be shown. Fixture submittals shall include scale drawings showing metal gauges and finish together with complete photometric distribution curves and coefficient of utilization tables. Glare factor curves shall also be submitted for each fixture. Failure to submit this information can be the basis for disapproval.

C. All descriptive and technical data and shop drawings shall bear signed certification that they have been carefully examined and found to be correct with respect to dimension, space available, non-interference with other trades and that the equipment complies with all the requirements of these specifications. Submittals that have not been checked for compliance will not be considered by the Engineer.

D. Only complete submittals will be considered, partial submittals will not be reviewed.

2.8 SUBMITTALS

A. Submittals shall be complete; bound booklets with an index of all items submitted including associated catalog/part numbers. The Contractor shall make submittals on all the following equipment (in addition to any special items indicated elsewhere in the plans or specifications):

1. Lighting Fixtures
2. Wiring devices
3. Conduit
4. Wire
5. Panelboards
6. Switchgear
7. Fuses
8. Metering equipment
9. Transformers
10. Starters
11. Contactors
12. Disconnect switches
13. Motor Control Centers
14. Lamps
15. Dimming systems
16. Special Systems equipment (Fire Alarm, Intrusion Alarm, Sound, TV, Lightning Protection, etc.).

B. Electrical System Controls: Refer to Section 253000 for additional submittal requirements.

C. After receiving approval on the make and the type of materials, the Contractor shall order such materials in sufficient time to prevent any delay or changes on the job.

PART 3 - EXECUTION

3.1 GENERAL

A. Fabrication, erection and installation of the complete electrical system shall be done in a first class workmanlike manner by qualified personnel experienced in such work and shall proceed in an orderly manner so as not to hold up the progress of the project. The Contractor shall check all areas and surfaces where electrical equipment material is to be installed, removed or relocated and report any unsatisfactory conditions before starting work. Commencement of work signifies the Contractor's acceptance of existing conditions. In the acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of workmen.

3.2 EQUIPMENT

A. Equipment and materials furnished by the Contractor shall fit the spaces allocated for them. Should the equipment which the Contractor proposes to install, require space conditions other than indicated on the drawings, it shall be the Contractor's responsibility to reconcile the available space with the equipment and make any changes required to accommodate the equipment. All required changes shall be made at the Contractor's expense.

B. All equipment, both the Contractor and Owner furnished, shall be installed in accordance with the manufacturer's recommendations.

3.3 COORDINATION

A. The Electrical Plans are diagrammatic but shall be followed as closely as actual construction and the work of other trades will allow. Such minor changes as are necessary to make the electrical work conform to the work of other trades and to the building shall be made without cost to the Owner.

3.4 CIRCUITS AND FEEDERS

A. Circuits and feeders shall be as shown and no deviations from the indicated outlet-circuit grouping will be permitted, except by permission of the Architect/Engineer. Branch circuit numbers are mandatory and shall be changed only on written permission from the Architect/Engineer. Any changes in layout or circuit numbering shall be accurately recorded on the "As-Built" drawings.

3.5 CONDUITS

A. In all spaces, such as ceiling spaces and equipment rooms, all conduits shall be run to a continuous grade and square to the building.

B. The plans do not give exact details as to the elevations of conduits, exact locations, etc., and do not show all off-sets, bends, junction boxes and other installation details. The Contractor shall carefully lay out his work at the site to conform to details of installation.

3.6 LOCATION OF EQUIPMENT AND OUTLETS

A. The approximate locations of cabinets, panelboards, wiring gutters, switches, light outlets, power outlets, etc., are indicated on the drawings; however, they are not intended to give complete and exact information. Determine the exact location after thoroughly examining the general building plans and by actual measurements during construction, subject to the approval of the Architect/Engineer.

B. Verify with Architect/Engineer, prior to installation, all locations of conduit, boxes, etc. stubbed or in the floor.

3.7 PROTECTION OF MATERIALS AND EQUIPMENT

A. The Contractor shall be responsible for the protection of all materials and equipment under this section of the work whether incorporated into the building or not.

B. The Contractor shall provide protection for all work where necessary and will be responsible for all damage done to property during the construction. The above protection shall be maintained while the work is in progress. In no case shall dirt, grit, etc., be ground into the floor finish or coverings.

C. The Contractor shall provide space for storage of materials and equipment at ground level.

3.8 CUTTING AND REPAIRING

A. Cutting and repairing shall be the responsibility of the Contractor. Coordinate to prevent unnecessary cutting and repairing. Lay out and locate equipment, openings and chases. Install sleeves, inserts and supports.

3.9 EXCAVATION AND BACKFILLING

A. The Contractor shall do all necessary excavation and backfill for the installation of the systems as may be required. Curb cuts, asphalt and concrete patching, etc., shall be part of the Contractor's responsibility. Any required trenching will be done by hand and all existing utilities avoided. Damage done to existing utilities will be repaired by the Contractor with no additional payment for the work. In addition to the above, trenches shall be backfilled with dirt, free from debris, rocks and other foreign matter. Backfill shall be replaced in the trenches in 6" layers and each 6" layer shall be wetted down adequately and properly tamped. Remove surplus dirt and leave premises clean. Perform excavation, backfilling and repaving required for work under this Division in accordance with DIVISION 2, SITE CONSTRUCTION. In general, backfill and tamp with compaction at least equal to that of the surrounding area.

3.10 WARRANTY

A. Deliver originals of all guarantees and warranties on this portion of the work to Owner. Warrant all equipment, materials and workmanship for one year in accordance with the terms of this Contract.

3.11 PRODUCT HANDLING

A. Use all means necessary to protect electrical materials and equipment before, during and after installation and to protect the installed work of other trades. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no extra cost to him.

END OF SECTION

SECTION 26 513

MEDIUM VOLTAGE CABLE

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers medium voltage cable, installation, and testing. Medium voltage, shielded power cables, sized per the Plans, related terminations and accessories for medium voltage electrical distribution systems, nominal 12.5kV services, are included in this section. Specifically included:
   1. Single conductor, medium voltage power cable.
   2. Cable grounding, grounding accessories and tools.
   3. Medium voltage cable terminations.
   4. Testing of medium voltage cable, splices and terminations.

B. Certification of the Qualifications of Medium-Voltage Cable Installers: The Contractor shall have current New Mexico EL-1 and EE-98 licenses. The Contractor shall submit a certification of attendance to, and for the approval of, the Engineer which contains the names of the Personnel who have successfully completed course(s) the splicing and termination of medium-voltage cables approved for installation under this contract. The certificate of attendance shall be current within five years of performing any cable terminations. The certification shall be accompanied by satisfactory proof of the raining and experience of persons listed by the contractor as cable installers.

C. Related Documents:
   1. Drawings and general provisions of the Contract apply to this Section.
   2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

D. Related Sections:
   1. Division 01 Section "General Requirements."
   2. Division 26 Section "Common Work Results for Electrical".
   3. Division 26 Section "Pad Switchgear".

1.2 REFERENCES

A. General:
   1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and more stringent shall apply.
   2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
   3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.
   4. Refer to Division 26 Section "Common Results for Electrical" for codes and standards, and other general requirements.
   5. All Standards shall be latest edition.

B. ASTM International:
   1. ASTM B-3, B-8, and B-496 - American Society for Testing Materials.

C. NFPA 70 - National Electrical Code.

D. IEEE C2 - the NESC (National Electrical Safety Code).

E. ICEA Publication No. S-93-639 NEMA WC7 - Insulated Cable Engineers Association.

F. IEEE 48 - Test Procedures and Requirements for High-Voltage Alternating-Current Cable Terminations.

G. NEMA WC 8 - Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

H. NETA – National Electrical Testing Association

I. Underwriters' Laboratories, Inc. (UL 1072).

1.3 ACTION SUBMITTALS

A. Submit under provisions of Division 26 Section "Common Results for Electrical - Review of Materials" and Division 01 Section "General Requirements."

B. Product Data: For each size and type of cable and cable termination and accessory indicated.

C. Manufacturer's product literature illustrating the following:
1. Cable characteristics.
2. Cable terminations including all deadbreak break modules and matching deadbreak break elbows.
3. Description of materials to be used for circuit labeling.
4. Cable pulling compounds, lubricants and pull-string.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each cable and accessory type, signed by manufacturers.

B. Cable pulling tension calculations and recorded values.

C. Manufacturer's Documentation: After approval by the Engineer of cable & cable terminations to be used, the cable manufacturer shall furnish the following information:
1. Source quality-control test reports. This includes proof that cable has been manufactured within twelve (12) months of its installation.
2. Copy of the manufacturer's splicing and termination procedures for approval.

D. Certifications and resumes of cable splicer(s) and terminator(s). See Section 1.4.C below.

1.5 QUALITY ASSURANCE

A. All conductors and cable shall conform to ICEA standards. Cable warranty shall begin upon the date of cable installation acceptance. Each length of cable delivered to the job shall have a certified test report from the factory stating that the cable meets the minimum standards for cables of this type as established by ICEA. The test report shall

also include month and year of manufacture which shall not exceed twelve (12) months prior to the delivery to the site. Copies of this report shall be delivered to the Owner's representative before the cable is installed.

B. Manufacturer's Qualifications: Company experienced in manufacturing Products specified in this Section with minimum of ten (10) years.

C. Cable Splicer & Terminator Qualifications:
1. Workers' Competency: Submit high voltage cable splicer certification of competency and experience 30 days before splices or terminations are made in high voltage cables. Splicer experience during the immediate past three years shall include performance in splicing and terminating cables of the types and classification being provided under this Contract. In lieu of a certification of competency, a Subcontractor may demonstrate the qualifications of a proposed cable splicer through formal training and relevant experience in splicing cables of the type and class under this Subcontract.
2. Before assigning cable splicer to work covered by this specification, the Contractor shall provide the Engineer with the names of the cable splicers to be employed, together with satisfactory proof that each splicer has had at least three years' experience in splicing high-voltage cables and is experienced with the type and rating of cables to be spliced. In addition, each cable splicer may be required to make an approved dummy splice in the presence of the Project Manager in accordance with manufacturer's instructions, before the splicer is accepted to splice cable covered by this Specification.
3. Material for dummy splices shall be furnished by the Contractor.

D. Source Limitations: Obtain cables, grounding, terminations, and associated materials through one source. Limit the number of manufacturers selected as much as possible.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authority Having Jurisdiction and marked for intended use.

F. Comply with IEEE C2 (NESC) and NFPA 70.

G. Comply with ASTM B3 and B8 for copper wiring, conductors, and cables.

H. NRTL (Nationally Recognized Testing Laboratory) Listing: Products shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for electrical and fire safety.

PART 2 - PRODUCTS

2.1 GENERAL

A. **Conductors, terminations, and all associated elements shall be rated 15kV.** Conductors shall be copper, single conductor primary cable with EPR 133% rubber insulation, bare copper tape, 5 mils minimum, shall be applied with a helical lap not less than 12.5% of its width, and PVC outer jacket.

2.2 MANUFACTURERS

A. Cable: Subject to compliance requirements, provide products by one of the following:
1. Okonite
2. Cablec
3. Southwire

B. Cable Terminations: Subject to compliance requirements, provide products by one of the following:
1. Elastimold (Thomas & Betts)
2. 3M; Electrical Products Division
3. Richards Manufacturing Co.

C. Fire and Electric Arc Proofing (if required): Provide 3M, Type 77, Scotch Brand or approved equal.

2.3 15KV CABLE

A. Cable Type: Single conductor, jacketed, 15KV rated, Type MV-105 approved for NEC applications.

B. Comply with UL 1072, AEIC CS 8, ICEA S-93-639/NEMA WC74, and ICEA S-97-682.

C. Conductor:
1. Material shall be annealed, uncoated, soft drawn copper in conformance with ASTM B-3.
2. The conductors stranding shall be Class B, concentric lay in accordance with ASTM B8 (compressed construction) or ASTM B496 (compact construction) if a slightly smaller cable diameter is needed.
3. Class B stranding per ASTM B-496.

D. Conductor Strand Screen/Shielding:
1. A semi-conducting shielding compound shall be applied by extrusion directly to the surface of the stranded conductor.
2. The semi-conducting material shall be compatible with the copper conductor and shall effectively bond to the insulation.
3. The semi-conducting shielding shall strip clean from the conductor for make-up of terminations and splices.

E. Conductor Insulation:
1. Discharge free, EPR insulation, color contrasted with strand and insulation screens.
2. The insulation material shall meet or exceed ICEA S-94-649, AEIC CS8, and CSA C68.5. It shall meet the electrical and physical requirements specified in Part 3, ICEA S-93-639.
3. Temperature Rating: 221 deg F (105 deg C) normal operation, 284 deg F (140 deg C) emergency overload operation, and 482 deg F (250 deg C) for short circuit conditions.
4. Voltage Rating: 15 kV
5. Insulation Thickness: 133 percent insulation level and insulated with a high quality, heat, moisture, impact, ozone, and corona resistant thermosetting EPR

that is suitable for use in wet or dry locations, in underground conduit and duct systems, and direct buried applications.

6. The average insulation thickness shall be not less than 220 mils; the minimum thickness at any point shall not be less than 90 percent of the specified average thickness.

F. Insulation Screen/Shielding:
   1. Extruded, semiconducting material meeting requirements of ICEA S-93-639/NEMA WC74 & S-97-682, and AEIC CS8. Substitution of a non-metallic semiconducting tape for the extruded covering is not acceptable.
   2. Note: cables using the extruded energy suppression and stress control material for the strand screen may use the same semiconducting material for the 15kV insulation screen.
   3. The extruded covering shall be at least 24 mils thick and shall be in intimate contact with the insulation. Covering shall be removable without damaging the insulation; leaving no residue that cannot be readily removed. Insulation screens must be clean stripping.

G. Copper Tape Shield
   1. Bare copper tape 5 mils minimum shall be applied with a helical lap not less than 12.5% of its width.

H. Overall/Outer Jacket:
   1. The cable shall have an overall sunlight resistant (UV) poly-vinyl chloride jacket
   2. The overall jacket shall be free stripping.

I. Electrical and Physical Tests:
   1. Qualification tests in compliance with Section B, AEIC CS8 are required for each shielded cable furnished.
   2. All materials used in construction of the cables shall be tested in compliance with the application paragraphs of ICEA S-93-639.
   3. All completed cables shall successfully pass the following tests prescribed in ICEA publication S-93-639 NEMA WC 74:
      a. Par. 6.5 - Aging.
      b. Par. 6.27 - Voltage.
      c. Par. 6.28 - Insulation Resistance.
      d. Par. 6.29 - Partial Discharge Extinction (Corona) Level.
      e. Par. 6.23 - Discharge Residence.
   4. Test methods and frequency of tests (for tests in F-2 and F-3 above) shall be as prescribed in Part 6 ICEA S-93-639.

J. Cable Identification: The following information shall be indicated, by means of a surface legend printed in compatible ink of contrasting color, at intervals not to exceed 24 inches (600 mm) over the entire length of the cable:
   1. Manufacturer's name.
   2. Conductor material.
   3. Conductor size.
   4. Maximum rated voltage.
   5. Insulation material.
   6. Letter designating cable type.
   7. Shielded or non-shielded.

8. Date of manufacture.

K. Shipment: The cable shall be shipped in continuous lengths. No cable splices are allowed. The shipment shall be made on carefully inspected non-returnable reels if possible. Cable ends shall be securely fastened to the reel using polypropylene rope ties. Metal ties shall not be used. Cable ends shall be completely sealed against moisture and contaminants. The cable on the reel shall be protected with plyboard or tekboard lagging held securely in place with steel banding.

L. Conductor and Shield Continuity: Each length of completed cable shall be tested for conductor and shield continuity. A simple continuity test can be accomplished by grounding the conductor at the source and checking for continuity from the end of each tap with an ohmmeter or with a battery and ammeter. See Sections 3.3 and 3.4 below.

M. Reports: Certified copies of Production Tests shall be furnished for each shipment of cable.

2.4 CABLE TERMINATIONS

A. General: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators (deadbreaks) with matching, stationary, plug-in, deadbreak-front terminals designed for cable voltage and for sealing against moisture. Elbow-type unit with 600-A continuous-current rating; designed for de-energized disconnecting and connecting; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

B. Construction: 100% peroxide-cured construction includes insulation and conductive EPDM materials. Deadbreaks shall be fully shielded and submersible, rated 15/25KV and 600A minimum.

C. Deadbreaks shall be designed for use on solid dielectric cable (XLPE or EPR) with extruded semi-conducting shields and concentric neutral, with or without a jacket. Provide adapters as required for terminating tape shield and drain wire jacketed cables.

D. Deadbreaks shall be useable on any comparably rated bushing interface that meets the requirements of IEEE 386. All T-bodies, cable adapters, insulating plugs, and compression connectors shall be designed to be interchangeable with those currently available from other major manufacturers that also meet the requirements of the IEEE 386 standard.

E. Minimum ratings of the fully assembled deadbreaks as follows:

1. Standard Voltage Class, kV…….15
2. Max Rating Phase-to-Phase, kV……..14.4
3. Max Rating Phase-to-Ground, kV……...……...…8.3
4. AC 60 Hz 1 Minute Withstand, kV……..…34
5. DC 15 Minute Withstand, kV……..……53

6. BIL and Full Wave Crest, kV……95
7. Min Partial Discharge Extinction, kV……..11
8. Continuous Rating, A…….. ….600
9. 4 Hour Overload Rating, A……..…900
10. Short Time Rating, kA……..…25.5

F. Easily connected or disconnected using standard hand tools and equipment in de-energized state.

G. Each deadbreak kit to be provided complete with:
1. Elbow connector housing
2. Copper compression connector/lug
3. Shear bolt connector/lug
4. Stud
5. Insulating plug with cap
6. Tube of lubricant
7. Cable adapter
8. Installation instructions
9. Crimp chart

2.5 CABLE SPLICES

A. Cable splices are not allowed. Run underground cables continuous between end termination points.

2.6 CIRCUIT LABELS

A. Manufacturers:
1. Almetek Industries, Type E-Z -Tag or equal.
2. Substitutions: Under provisions of Division 01 Section "General Requirements".

B. Description: Cable circuit labels shall be 1-1/2 (38 mm) high, polyethylene, with black on yellow characters, in a polyethylene holder, attached to the cable by two nylon self locking ties.

PART 3 - EXECUTION

3.1 15KV CABLE INSTALLATION

A. Carefully protect cable from mechanical damage. Provide suitable mechanical protection for reels.

B. Pull cable directly from reels into the ducts or conduits. It may not be laid on the ground or otherwise handled for cutting or sorting. Pulling lubricant, UL-listed and compatible with the cable being pulled, as manufactured by IDEAL, Y-ER-EAS, or equal, shall be generously applied. Pulling tension (lbs) not to exceed 0.008 times the circular-mil

cross-sectional area of the conductor. Cables shall not be pulled through more than one intermediate manhole on one pull. Cable ends shall be sealed against moisture after pulling. Pull ropes shall be non-metallic to prevent cutting of duct materials.

C. Pulling tension and side wall pressure shall not exceed the manufacturer's allowable values. Pulling tension shall be continuously monitored during a pull by use of a dynamometer. The dynamometer shall have been calibrated within a year of its use on the project. If the pulling tension or sidewall pressure is exceeded during a pull, the cable shall be considered damaged and shall be replaced by the Subcontractor.

D. Installation of Cables in Manholes and Handholes: Cable shall not be installed utilizing the shortest route but shall be routed along those walls providing the longest route and the maximum spare cable lengths. Cables shall be formed closely parallel to the walls, shall not interfere with duct entrances, and shall be supported on brackets and cable insulators, spaced at a maximum of four feet. In existing manholes and handholes where new ducts are to be terminated or where new cables are to be installed, the existing installation of cables, cable supports, and grounding shall be modified as required for a neat and workmanlike installation with cables properly arranged and supported.

E. Split wire-basket cable grips shall be used to restrain conductors in manholes, handholes, and pull boxes on downhill duct runs.

F. Splicing of cable within manholes is not allowed. Cables shall be continuous until terminations.

G. Maintain existing phase rotation of the system as required for all new sections of cables. Perform phase rotation verification in conjunction with Owner's staff.

3.2 CABLE TERMINATIONS

A. Cable terminations shall be per written Manufacturer instructions. The Contractor shall furnish for approval two (2) copies of the manufacturer's termination procedures.

B. Terminating cables onto deadbreaks is a complex, precise, and time-consuming process requiring great care. Cable terminations shall only be done by a qualified contractor specializing in high-voltage splicing, terminations, and testing. Utilize experienced cable splicers having experience specified in the Quality Assurance article above. Follow written manufacturer instructions.

C. Grounding of Shielded Cables: Provide a No. 12 AWG or larger solid copper ground connection brought out of each deadbreak break termination in a watertight manner and grounded to the ground bus within the switch. Wire shall be trained to the sides of the enclosure in a manner to avoid interference with the working area.

D. The ground bus and bare copper-conductor ground wires shall be bonded to the new ground rods and grounds provided in manhole or vault.

3.3 15KV CABLE LABELING

A. 15KV circuits shall have each phase tagged (A, B, or C) at termination points and on either side of each splice in a manhole, using plastic tie-tags.

B. At each manhole, handhole or pull box, 15kV circuit labels, as shown on the drawings, shall be attached to each cable group. As the cable enters it shall be labeled to identify the source. As the cable leaves it shall be labeled to identify its destination. At approximately the center of the cable group it shall be identified with its feeder circuit designation.

3.4 15KV CABLE TESTING IMMEDIATELY AFTER INSTALLATION

A. Immediately after cables have been installed, the Contractor shall notify the Owner when the installation is available for testing. The Owner shall have a representative onsite to witness testing.

B. Each conductor shall be individually tested with other conductors grounded. Shields shall be grounded. Record all test results.

C. A shield continuity test shall be performed by the ohmmeter method. Record all ohmic values.

D. The Contractor shall produce a written record of tests and, upon completion of the project, assemble and certify a final test report no later than ten days after completion of the tests. The Owner shall receive three (3) copies of the final test report.

3.5 15KV CABLE TESTING AFTER END TERMINATION PREPARATION

A. Immediately after cables have been spliced and cable ends prepared for termination, but not connected to equipment, the Contractor shall notify the Owner when the installation is available for testing. The Owner shall have a representative onsite to witness testing.

B. Each conductor shall be individually tested with other conductors grounded. Shields shall be grounded.

C. A shield continuity test shall be performed by the ohmmeter method. The ohmic value shall be recorded.

D. The Contractor shall produce a written record of tests and, upon completion of the project, assemble and certify a final test report no later than ten days after completion of the tests. The Owner shall receive three (3) copies of the final test report.

3.6 TEST REPORTS

A. Submit test reports in accordance with the “General Conditions” of this specification. Test reports shall certify that all cables, terminations and splices have met the minimum acceptance standards. Test reports shall be in log form and include the cable segment, date, time and personnel present during testing.

END OF SECTION

SECTION 261200

MEDIUM VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish and install transformers complete with all necessary appurtenances to perform the voltage transformation as required.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of transformers and are based on the specific system indicated and shall be the latest edition of standards specified.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C2.

D. Comply with DOE 2016 (dry tape up to 35 kV primary and 2500 kVA).

E. Liquid filled: Comply with ANSI C57.12.10, ANSI C57.12.28.

F. Dry tape: Comply with IEEE C57.12.01, ANSI C57.21.50, ANSI C57.12.51, IEEE C57.12.56, IEEE C57.12.91, and IEEE C57.94.

G. Oil or dry type: IEEE C57.12.70 and IEEE C57.12.80.

H. Comply with NFPA 70.

1.4 SUBMITTALS

A. Submit complete shop drawings with outline dimensions, wiring diagrams, catalog cuts and descriptive literature, including no load loss, total loss, regulation at 100% and 80% power factor, and net weight. If requested by the Engineer, submit production line impulse test reports.

B. Certification of the Qualifications of Medium-Voltage Cable Installers: The Contractor shall have current New Mexico EL-1 and EE-98 licenses. The Contractor shall submit a certification of attendance to, and for the approval of, the Engineer which contains the names of the Personnel who have successfully completed course(s) the splicing and termination of medium-voltage cables approved for installation under this contract. The certificate of attendance shall be current within five years of performing any cable

terminations. The certification shall be accompanied by satisfactory proof of the training and experience of persons listed by the contractor as cable installers.

1.5 RELATED WORK IN OTHER SECTIONS

A. Site work, services.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB.
2. Cooper Industries; Cooper Power Systems Division.
3. Cutler-Hammer.
4. GE Electrical Distribution & Control.
5. Square D; Schneider Electric.

2.2 PADMOUNTED TRANSFORMERS

A. General: Sizes and characteristics as shown on drawings, loop or radial feed as shown on drawings. Unless otherwise specified on the drawings, transformers to be three-phase 60 hertz, 65 degree C temperature rise, liquid filled, self-cooled, pad mounted, compartmentalized distribution transformers, rated 1,500 KVA and below for use with separable insulated high-voltage connectors rated 8.3/14.4 KV. All characteristics, definitions, terminology, and voltage designations, except as otherwise specified herein, shall be in accordance with applicable provisions of the latest edition of ANSI C57.12.26, or its C57.12.00, C57.12.90, and C57.12.80, or the latest editions. Transformers shall be of triplex or five-legged core design and connected wye-wye with primary and secondary neutrals internally connected and brought out to a neutral bushing in the secondary compartment. All windings shall be copper.

B. ELECTRICAL CHARACTERISTICS: KVA ratings will be as indicated on the drawings. Voltage ratings and tap ratings shall be 2-21/2% above and below. Taps shall be suitable for de-energized operation only. The tap changer switch shall be ganged and shall be externally operable. The operating handle shall be located either in the high compartment above the low voltage bushings or in the secondary compartment above the low voltage bushings. The tap changer shall be set on the 100% tap at the factory and shall be secured to prevent inadvertent change from this position. Minimum impedance's will be as follows:

KVA	SECONDARY VOLTAGE	IMPEDANCE
UP TO 500	208Y/120	4.5%
UP TO 500	480Y/277	4.5%
750 & ABOVE	208Y/120	5.75%
750 & ABOVE	480Y/120	5.75%

C. Construction: The padmounted transformer shall consist of the transformer tank, high voltage cable terminating compartment and the low voltage cable terminating compartment. The transformer tank and compartments shall be assembled as a raintight

and weatherproof tamper resistant integral unit suitable for mounting on a flat surface. There shall be no exposed screws, bolts, or other fastening or hinging devices (other than the pentahead specified) which are externally removable. There shall be no opening through which foreign objects such as sticks, or wires might be inserted to contact energized parts. Suitable means for padlocking the compartment door(s) shall be provided. Normal entry shall be possible only with the use of proper access tools. The high- and low-voltage compartments shall be located side by side on one side of the transformer tank. When facing the compartment, the low voltage compartment shall be on the right. Construction of the unit shall be such that it can be lifted, skidded and slid onto place on the mounting pad without disturbing the entrance cables. The transformer tank base shall be raised above the pad to protect the bottom finish during installation and to minimize corrosion due to moisture accumulation. The base shall be cross braced to permit rolling in two directions. All external surfaces of ferrous material used in the construction of the assembly shall have undercoating over the regular finish, applied to the bottoms of the components and extending up the side to a point 1 inch above the bottom of their bases. All exterior surfaces shall be painted using a system of coordinated and thoroughly tested materials and application techniques that will assure long life in outdoor exposure. The finish shall be weather-resistant, green color Munsell No. 7.0 GY 3.29/1.5. Total paint thickness measured anywhere on inside or outside of transformer and cabinet shall not be less than 3.5 mils. All external surfaces shall be constructed of steel, 13 USS gauge or thicker. The transformer and compartment hoods shall be crowned to ensure water runoff.

D. High- and Low-Voltage Compartments: Terminal compartments shall be full height, air filled compartments with separate hinged doors. The compartments shall be completely isolated from each other by a steel barrier without opening or discontinuity of any kind. The edges of the access doors shall be formed to provide a close-fitting mating surface, with internal insertion-prevention lip that will be shaped to resist entry or prying by screwdrivers, wrecking bars, tire irons, single-socket lug wrenches or other readily accessible tools. Hinges and hinge pins shall be passivated AISI Type 304 stainless steel or equivalent corrosion-resistant metal. There shall be a threaded fastening device for the high voltage door, accessible only through the low voltage compartment. Screen door latches with wing nuts, gravity hooks, etc. are unacceptable. The compartment doors shall have a minimum of three-point latching and the handle shall have provisions for pad locking. The padlocking device shall be so designed and located as to resist prying or breaking off by screwdrivers, wrecking bars, tire irons, single-socket lug wrenches or other readily accessible tools and to inhibit removal of the padlock with a bolt cutting device or hacksaw. In addition to the regular locking provisions above, the access doors shall be secured by a captive, recessed pentahead bolt. Bolts and associated hardware must be rust and corrosion resistant and the design shall minimize the possibility of misalignment and cross-threading. The design must be such that wire entry through the bolt hole into the compartment(s) is prohibited when the bolt is removed. The non-rotating cup shall be permanently attached. The captive pentahead bolt shall be coordinated with the latch and padlock to prevent unlatching and insertion of the padlock into the hasp when and until the bolt is completely threaded, respectively. The captive pentahead shall also function as an interlock device to pin the latch closed. Both compartment doors shall be equipped with stops for holding each door in a 90-degree open position. The stops shall be captive to prevent loss of the device. Doors on the high- and low-voltage compartments shall be of sufficient size to provide adequate working space when open. The bottom edge of the transformer shall provide for flush mounting on a flat rigid surface to prevent wire entry into the compartment.

E. Bushings and Terminals: Electrical characteristics of completely assembled low-voltage terminations shall comply with Table 4 of ANSI C57.12.26, or the latest edition unless otherwise stated herein. All low voltage terminals shall be insulated from the tank with 1.2 KC OF % KV class bushings as applicable. Terminals of 480Y/277 and 208Y/120-volt windings shall be arranged to the specified dimensions shown in Figures 7 and 8 (a) of ANSI C57.12.26, or the latest edition. In-line arrangements are unacceptable. The high voltage neutral shall be connected to the low voltage neutral internally with provision for opening this connection for testing. The low voltage neutral shall be a fully insulated bushing. A ground pad shall be provided. A removable copper ground strap shall be provided and connected between the neutral bushing and ground pad. The ground strap shall be capable of carrying a line to ground fault of the magnitude and duration defined in ANSI C57.12.00b, or the latest edition. A hand hole shall be provided to access the removable connection specified in 7.3. Low voltage terminals shall be spades with NEMA hole spacing to provide the number of holes given in the following table.

Secondary Terminal Construction

Secondary Voltage	Transformer KVA Size/Hole Count						
	75	150	300	500	750	1000	1500
208Y/120	4	6	6	8	8	--	--
480Y/277	4	6	6	6	6	8	8

F. High voltage terminals shall be bolted type bushing wells in accordance with ANSI/IEEE 386, or the latest edition and ANSI C57.12.26, or the latest edition. Bushing wells shall be in accordance with Figure 1 of ANSI/IEEE 386, or the latest edition, and shall be arranged in accordance with the specific dimensions of Figures 5 and 7 of ANSI C57.12.26, or the latest edition. Transformers design shall allow field replacement of the high voltage bushing wells and low-voltage bushings by means of common hand tools and oil-handling equipment, without totally untanking the transformer.

G. Accessories: The following accessories are required on all transformers:

1. Pressure relief device. The following are approved:
   a) Qualitrol 202 Series
   b) Tomco/Beta 1712K-3
2. Upper filter valve or plug.
3. Full-Capacity Voltage Taps: Four nominal 2.5% taps, 2 above and 2 below rated primary voltage; accessible by removing the enclosure panels.
4. Combination drain, lower filter valve, and sampling device.
5. The following accessories are required on all transformers rated 750 KVA and above:
   a) Liquid level gauge.
   b) Top oil thermometer.

H. A suitable marking inside the tank shall indicate the correct liquid level at 25 degree C temperature.

I. Jacking, Rolling, Lifting, and Mounting Facilities: Suitable jack bosses or equivalent jacking facilities shall be provided on the tank. vertical clearance for a jack shall be 1-1/2 inches minimum, 3-1/2 inches maximum. Transformer base shall be arranged for rolling

in two directions: Parallel to and at right angles to the center line of the high-voltage bushings. These lugs shall be of adequate strength and size and arranged on the tank to provide a suitable lift for the completely assembled unit. A 3/4 inch minimum and a 1-1/2-inch maximum internal flange shall be provided at the base of the high-voltage and low-voltage compartments, to provide means of anchoring the unit to the pad.

J. Terminal Markings: External terminals shall be marked H1, H2, H3, HoXo, X1, X2, X3, by stenciled yellow lettering on the tank. A winding diagram with high and low-voltage connections shall be shown on the instruction nameplate.

K. Instruction Nameplate: Instruction nameplate shall be located on the inside of the low-voltage compartment door. Instruction nameplate shall contain the information specified in paragraph 5.12 ANSI C57.12.00, or the latest edition nameplate B, and shall be easily readable. Nameplate shall indicate that the transformer oil contained less than 1 ppm PCB at time of manufacture.

L. Oil Preservation: Transformers shall be of sealed tank construction, so designed that the interior is sealed from the atmosphere and the gas plus oil volume remains constant. The transformer shall remain effectively sealed for all temperatures to plus 105 degree C top oil.

M. Tanks: The tank shall be of sufficient strength to withstand a pressure of 7 psi gage, without permanent distortion.

N. Overcurrent Protection: Internal fuse protection shall be accomplished through the use of drawout, load break, current limiting fuses in a dry well. Fuses to be sized for transformer protection. Fuses shall be in series with a gang-operated, load break oil switch in the configuration as shown on drawings.

O. Switching: Provide an oil-immersed, gang-operated, two-position, loadbreak, manually operated switch.

2.3 GROUNDING

A. The materials, equipment, and devices related to the grounding system are specified under other sections of these specifications.

PART 3 - EXECUTION

3.1 SEPARATELY DERIVED SYSTEMS

A. Transformers creating separately derived distribution systems such as dry type transformers shall utilize the equipment ground bars in the transformer enclosure for both secondary equipment ground and secondary neutral ground. The size of grounding conductor from the transformer to the main equipment ground shall be determined by considering the transformer secondary as a service.

3.2 TESTING

A. The Contractor shall test the complete grounding system with a megger at the service ground bar and shall submit a written report to the Engineer for approval. The service

shall not be energized if the test shows more than 5 ohms, unless approved by the Architect.

3.3 GROUNDING CONNECTIONS

A. Clean surfaces thoroughly before applying ground lugs or clamps. If the surface is coated, the paint, enamel or lacquer must be removed. Where galvanizing is removed from metal, it shall be painted or touched up with "Galvanox."

3.4 IDENTIFICATION

A. Provide an engraved micarta label on front of the tank indicating the transformer power source and the panel fed by the transformer.

END OF SECTION

SECTION 26 0519

LOW VOLTAGE CONDUCTORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish and install all conductors as required for the complete installation and operation of all electrically serviced and/or operated equipment, devices and systems throughout the project.

1.3 RELATED WORK IN OTHER SECTIONS

A. Conduit, feeders, wiring devices and plates, equipment connections, panelboards, transformers, lighting equipment and lamps.

PART 2 - PRODUCTS

2.1 WIRES AND CABLES (600 VOLTS)

A. Type: Conform to the applicable UL and ICEA Standards for the use intended. Copper conductors with 600 volt insulation unless otherwise specified or noted on the drawings. Stranded conductors for No. 6 and larger except where elsewhere specified or noted on the drawings.

B. Use of aluminum conductors will not be permitted.

C. Insulation: Type THWN, 75 degree C. insulation unless otherwise specified or noted on the drawings. 90 degrees C. minimum insulation within fixture wireways of fluorescent fixtures. Where 90 degree C. insulation is specified, the termination points for this conductor shall be rated for 90 degree C.

D. Size: No. 12 minimum unless otherwise specified or noted on the drawings. In the case of "homeruns", no conductor smaller than #10 shall be used for runs over 100 feet in length on 120 volt circuits. Not less than NEC requirements for the system to be installed. If the equipment to be installed requires larger conductor and conduit sizes than indicated on the drawings, the required changes shall be made without additional charge. Remote control wires, other than Class 2 remote control and signal circuits, shall be no smaller than #14.

E. Color Coding: Phase, neutral and equipment ground conductors color-coded. Connect all conductors of the same color to the same phase conductor. Color coding shall be A-black, B-red, C-blue, N-white, for 250 volts or less. A-yellow, B-orange, C-brown, N-off white or grey, for 251-600 volts, with green for all equipment ground conductors. Conductors No. 12 and 10 shall be solid color compounded for the entire length.

Conductor sizes larger than No. 10 may be color coded at each termination and in each box or enclosure with six inches of half-lapped 3/4 inch pressure sensitive, plastic tape of respective colors in lieu of solid color compound. The equipment grounding conductor shall be bonded to the outlet box grounding screw with taps to receptacles and equipment. Isolated ground conductors shall be green in color with a yellow trace.

2.2 CONTROL CONDUCTORS

A. Copper, minimum size No. 14 with 19/35 stranding, color coded filled cross linked polyethylene 75 degree C. 600 volt insulation and neoprene or equal outer jacket. Multi conductor control cables shall be provided where more than three control conductors are installed in the same conduit between common terminations. Provide two spare conductors minimum in each control cable.

2.3 DATA/COMMUNICATION AND ELECTRONIC CABLE

A. As required or specified in the section of these specifications specifying the equipment. Splices shall be twisted and soldered or shall use an approved connector.

B. All Cat. 3 and Cat 5 cabling shall be tested in accordance with EIA/TIA performance standards. Refer to 16740 for more detailed information.

2.4 VERTICAL CABLE SUPPORTS

A. Split wedge type supports which clamp each individual conductor and tightens due to weight of the cable shall be used for cables without metallic sheath. Basket weave type supports shall be used for cables with metallic sheath.

2.5 CONNECTORS AND LUGS

A. For Copper Conductors No. 6 and Smaller: 3M Scotch-Lok or T & B Sta-Kon compression or indent type connectors with integral or separate insulating caps.

B. For Copper Conductors Larger Than No. 6: Solderless, indent, hex screw or bolt type pressure connectors, properly taped or insulated.

2.6 TAPE

A. Plastic tape, 8.5 mils minimum thickness, 1,000,000 megohms minimum insulation resistance, oil resistant vinyl backing, oil resistant acrylic adhesive, incapable of supporting combustion per ASTM D-568 Test Method B.

PART 3 - EXECUTION

3.1 CONDUIT SYSTEMS

A. A complete system of conductors shall be installed in the raceway systems. Control wires shall be run in separate conduits from conductors of other systems. All conductors of all systems shall be installed in raceway or conduit.

B. Lighting fixtures shall not be used as raceways for circuits other than parallel wiring of fixtures. Wiring in fixtures shall be rated for that purpose.

C. When leaving a metal raceway or conduit in a cabinet, box, switch, enclosure, control enclosure or any other like member, conductors shall be protected by means of insulated bushings or end fittings. These protectors shall be "O.Z." type or similar.

D. Conductors may be run in multiple sizes #1/0 to 500 kcmil inclusive provided all multiple conductors are the same size, length and type of insulation. Multiple runs are to be in separate conduits. Each conduit to include one set of phase conductors, neutral and grounding conductors. All to conform to NEC 300-20.

E. No splices or taps shall be made in any conductors except in outlet boxes, pull boxes, junction boxes, panelboard boxes, manholes or splice boxes. All taps and splices shall be made with solderless connectors and insulated in such a manner that provides an effective insulation equal to that of the adjoining wire. Any splice or tap shall be made only on conductors which are a component part of a single circuit properly protected by approved methods.

F. Before any wire is pulled into any conduit, the conduit shall be thoroughly swabbed in such a manner as to remove all foreign material and to permit the wire itself to be pulled in a clean, dry conduit. The Contractor shall use only approved wire pulling lubricants for pulling any wire. All conductors shall be pulled into their respective conduits by hand, except where written permission of the Engineer is secured to the contrary.

3.2 WIRE AND CABLE TESTS (600 Volts)

A. Measure the insulating resistance of service entrance conductors, feeder circuit conductors and service ground. Measurements shall be taken between conductors and between conductors and ground. Resistance shall be 1,000,000 ohms or more when tested at 500 volts by megger without branch circuit loads. Tests and procedures shall meet the approval of the Architect/Engineer and shall be in accordance with the applicable IPCEA standards for the wires and cables to be installed. Furnish all instruments, equipment and personnel required for testing and conduct tests in the presence of the Architect/Engineer. Submit written reports of the tests and results when requested.

3.3 PULL WIRES

A. In each empty conduit, except underground conduits, install a No.14 galvanized steel pull wire or a plastic line having a tensile strength of not less than 200 pounds. In each empty underground conduit, install a No. 10 AWG bare, hard drawn copper or copper clad pull wire or a plastic line having a tensile strength of no less than 200 pounds.

3.4 IN RACEWAYS

A. Install conductors in rigid conduit, EMT or flexible metallic conduit, unless otherwise specified or noted on the drawings.

3.5 CABLE BENDS

A. Radius of bends not less than 10 times the outer diameter of the cable.

3.6 BUNDLING

A. In cabinets conductors No. 10 and smaller shall be neatly and securely bundled and conductors larger than No. 10 shall be neatly and securely cabled in individual circuits, utilizing marlin twine, two ply lacing or nylon straps.

3.7 CONDUCTOR PULL

A. Conductors shall not be pulled into conduits until after all plastering or concrete work is completed and all conduits in which moisture has collected have been swabbed out.

3.8 FEEDER IDENTIFICATION

A. Tag feeder circuits in each enclosure with wrap around circuit designation labels where more than one feeder passes through or terminates in the enclosure.

3.9 CONNECTORS AND LUGS

A. Install with manufacturer's recommended tools and with the type and quantity of deformations recommended by manufacturer.

B. Contractor shall review one-line and other Drawings to assure that proper lugs are provided in termination equipment such as switches, panels, switchboards, mechanical equipment, etc. Due to voltage drop conductor sizes and/or numbers may not be accommodated by the equipment affected. If manufacturer cannot provide the proper number and size of lugs within their equipment the Contractor shall provide enclosures and properly sized terminals to convert the oversized cable, number and size that is compatible to the equipment affected.

END OF SECTION

SECTION 26 0526

GROUNDING

PART 1 - GENERAL

1.1 RELATED WORK IN OTHER SECTIONS

260519 Low Voltage Conductors
260533 Raceways, Boxes and Fittings
262416 Panelboards
262716 Cabinets
262726 Wiring Devices and Plates
262800 Motor and Circuit Disconnects.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials, equipment and devices related to the grounding system are specified under other sections of these specifications.

PART 3 - EXECUTION

3.1 GENERAL

A. Install two separate grounding systems, a service grounding system and an equipment grounding system. The service equipment, conduit systems, supports, cabinets, equipment, and neutral conductor shall be grounded in accordance with the minimum code requirements and as further indicated on the drawings or specified. Connect the two grounding systems together only at the main service equipment and at the secondary terminals of transformers creating separately derived distribution systems such as dry-type transformers.

3.2 SERVICE GROUNDING SYSTEM

A. General: The service grounding system is provided for the AC service neutral ground. Current return conductors, such as neutrals of the service entrance, feeder circuits and branch circuits, shall not be used for equipment grounding. Care must be exercised to insure that neutral bars are not bonded to the enclosures of panelboards, etc., which are not part of the main service equipment. Except for separately derived systems, the neutral conductors shall be grounded only in the main service equipment.

B. Common Ground Point: Establish one common ground point in the main service equipment by interconnecting the insulated neutral bus (or bar), the uninsulated equipment ground bus (or bar), and service grounding electrode conductor.

C. Neutral Disconnecting Means: Install a neutral disconnecting means in the main service equipment for disconnecting and isolating the neutral bus from the common ground. The disconnecting means may be disconnecting links in the interconnection between the insulated neutral and uninsulated equipment ground.

D. Neutral Bars: Provide an insulated neutral bar, separate from the uninsulated equipment ground bar, in all panelboards, transformers, starters, disconnect switches, cabinets, etc. which have neutral connections.

3.3 EQUIPMENT GROUNDING SYSTEM

A. General: Provide a complete equipment grounding system in accordance with the minimum code requirements and as further indicated on the drawings or specified. The equipment ground (green conductor) consists of metallic connections to ground of non-current carrying metal parts of the wiring system or apparatus connected to the system. The primary purpose of equipment grounding is to provide greater safety by limiting the electrical potential between non-current carrying parts of the system and to provide a low impedance path to ground for possible ground fault currents.

B. Common Ground Point: Establish one common ground point as specified elsewhere in this section of the specifications for interconnection of the equipment grounding system and the service grounding electrode conductor.

C. Service Equipment Enclosure: Bond the enclosure of the main service equipment to the uninsulated equipment ground bus (or bar) with a conductor or bar sized for 25% of the largest service overcurrent device.

D. Ground Bar: Provide an uninsulated equipment ground bar, separate from any insulated neutral bar, in all switchboards, panelboards, transformers, motor control centers, starters, disconnect switches, cabinets, etc. for grounding the enclosure and for connecting other equipment ground conductors. The ground bar shall be an integrally mounted and braced bus bar in switchboards or a separately mounted bar adequately braced or bolted to the enclosure of other types of equipment. The ground bar shall be adequately braced or bolted to the enclosure after thoroughly cleaning both surfaces to assure good contact. Provide solderless pressure connectors for all conductor terminations. Number and size of pressure connectors on equipment grounding bars as required for the termination of equipment grounding conductors. In addition to the active circuits, provide pressure connectors for all three-phase spares and spaces.

E. Conduits: Where metallic conduits terminate without mechanical connection to a metallic housing of electrical equipment by means of lock nut and bushings, provide ground bushing connected with a bare copper conductor to the ground bar in the electrical equipment. Metallic conduits containing ground wiring only shall be bonded to the ground wire at both conduit entrance and exit. Install grounding conductor in each nonmetallic conduit or duct except those used for telephone, sound, or low-voltage signals and in all flexible conduit that does not have a built-in ground conductor. Bond the conductor at both ends to the equipment grounding system.

F. Feeders and Branch Circuits: Provide a separate green insulated equipment grounding conductor for each single or three-phase feeder and each branch circuit with a three-phase protective device. Provide a separate green insulated equipment grounding conductor for single phase branch circuits unless otherwise indicated. Install the required grounding conductor in the common conduit or raceway with the related phase and/or neutral conductors and connect to the box or cabinet grounding terminal. Where there are parallel feeders installed in more than one raceway each raceway shall have a green insulated equipment ground conductor.

G. Devices: Install a minimum No. 12 green insulated equipment bonding conductor from a grounding terminal in the respective outlet or junction box to the green ground terminal of all receptacles and through flexible conduit to all light fixture housings.

H. Motors: Install a separate green insulated equipment grounding conductor from the equipment ground bar in the motor control center of separate starter through the conduit and flexible conduit to the ground terminal in the connection box mounted on the motor. Install the grounding conductor in the common conduit or raceway with the related motor circuit conductors.

3.4 SEPARATELY DERIVED SYSTEMS

A. Transformers creating separately derived distribution systems, such as dry-type transformers, shall utilize the equipment ground bars in the transformer enclosure for both secondary equipment ground and secondary neutral ground with separate grounding conductor extended to an approved ground electrode.

3.5 GROUNDING ELECTRODE SYSTEM

A. A minimum of two service ground electrodes shall be utilized. One shall be the main cold water metallic water piping system and the other shall be a made electrode consisting of not less than twenty feet of bare copper conductor encased along the bottom of a concrete foundation footing which is in direct contact with the earth (NEC 250-81c). Make the connections to the cold water pipe inside the building at the point of entrance. Other grounding electrodes (building steel, ground counterpoise, etc.) shall be bonded to the grounding electrode system where utilized. The grounding electrode for separately derived systems shall be approved for the application.

3.6 GROUNDING CONDUCTORS

A. The grounding electrode conductors for the service grounding electrode system shall be insulated or bare copper, sized in accordance with NEC 250-94 (a), including the conductor for the supplemental electrodes. The conductors shall be continuous without joint or splice and shall be installed in conduit with the conduit bonded to the conductor at each end. Install the conductor to permit the shortest and most direct path and terminate in the main service equipment on the common ground point. Equipment grounding conductors shall be green insulated conductors equivalent to the insulation on the associated phase conductor, but not less than Type TW. The equipment grounding conductor or straps shall be sized in accordance with NEC. Where one feeder serves a series of panelboards or transformers, the equipment grounding conductor shall be continuous without splices. Grounding conductors shall not be installed through metal-sheathed holes. All connections shall be available for inspection and maintenance.

3.7 GROUND CONNECTIONS

A. Clean surfaces thoroughly before applying ground lugs or clamps. If surface is coated the coating must be removed down to the bare metal. After the coating has been removed apply a non-corrosive approved compound to cleaned surface and install lugs or clamps. Where galvanizing is removed from metal it shall be painted or touched up with "Galvanox", or equal.

B. All grounding connections to bare stranded wire, ground rods, etc. shall be BURNDY HY-GROUND™ or approved equivalent or approved exothermic connection method. All connectors shall meet the requirements of IEEE STD 837 (Latest Revision), "IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding". All connectors must be listed by Underwriters Laboratories for direct burial in earth or embedment in concrete applications according to ANSI/UL-467 (latest revision), "Standard for Grounding and Bonding Equipment." Connectors must be suitable for lightning protection applications. Listing to UL-96 "Lightning Protection Components" preferred on applicable items.

3.8 TESTS

A. Test the completed grounding system with a megger at the service ground bar and submit a written report to the Architect/Engineer for approval. The service shall not be energized if the test shows more than 5 ohms, unless approved by the Architect/Engineer.

END OF SECTION

SECTION 26 0533

RACEWAYS, BOXES AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish and install complete conduit systems for the various electrical systems required for this project. Systems shall be complete with supports, mounting devices, pull boxes, etc., as required for installation of wiring systems and terminal devices.

1.3 RELATED WORK IN OTHER SECTIONS

A. Site work, wiring devices and plates, feeders, panelboards, lighting equipment and lamps, telephone system, transformers and services.

PART 2 - PRODUCTS

2.1 CONDUITS

A. Steel Conduit: Rigid, threaded, thick wall, hot dipped galvanized.

B. Electrical Metallic Tubing (EMT): Mild steel, zinc coated on the outside and either zinc coated or coated with an approved corrosion resistant coating on the inside. Maximum size 2 inch electrical trade size unless noted on the drawings or specifically approved.

C. Intermediate Metal Conduit (IMC): Rigid, threaded, lightweight steel, zinc-coated on the outside and either zinc-coated or coated with an approved corrosion resistant coating on the inside.

D. Flexible Conduit: Commercial "Greenfield," galvanized steel, with a separate grounding bond wire installed in the conduit in addition to other wires.

E. Liquid Tight Flexible Conduit: Flexible galvanized steel tubing with extruded liquid tight PVC outer jacket and a continuous copper bonding conductor wound spirally between the convolutions. Where a separate grounding conductor is installed in the conduit, bonding conductor in the convolutions may be omitted.

F. Plastic coated rigid steel conduit shall be hot dipped galvanized steel conduit with a coating of polyvinyl chloride, minimum 15 mills (0.015), on the exterior surfaces, shall have an approved corrosion resistant coat inside. To be Pittsburgh, J & L, Republic or approved equal.

G. Rigid Non-Metallic Conduit: Schedule 40, high impact PVC with 7,000 psi tensile strength at 73.4 degree F., 11,000 psi flexural strength, 8,600 psi compression strength,

approved for 90 degree C. conductors. Carlon, triangle, or approved equal. PVC conduits shall include a ground wire sized as noted or as required by NEC (whichever is larger). No bends shall be made in PVC. Rigid galvanized steel conduit shall be utilized for all elbows, risers and bends.

H. Aluminum Conduit: Shall not be used unless specifically indicated on the drawings for specialized purposes.

I. Conduit Size: Minimum conduit size, 1/2 inch except where specifically approved for equipment connections. Sizes not noted on drawings shall be as required by the NEC. All homeruns to panels shall be 3/4 inch minimum. Conduits for #12 THWN wire shall be sized the same as for #12 THW wire.

2.2 CONDUIT FITTINGS

A. Connectors and Couplings: Compression type threadless fittings for rigid steel conduit or IMC not permitted. EMT couplings and connectors either steel or malleable iron only, "Concrete Tight" or "Raintight" and either the gland and ring compression type or the stainless steel multiple point locking type. Connectors to have insulated throats. EMT fittings using set screws or indentations as a means of attachment are not permitted.

B. All conduits shall terminate in bushings or connectors which are insulated type, designed to prevent abrasion of wires without impairing the continuity of the conduit grounding system.

C. Rigid Steel Conduit, IMC and EMT Fittings: Iron or steel only.

D. Liquid Tight Flexible Conduit Fittings: With threaded grounding cone, a steel, nylon or equal plastic compression ring and a gland for tightening. Either steel or malleable iron only with insulated throats and male thread and locknut or male bushing with or without "O" ring seat. Each connector shall provide a low resistance ground connection between the flexible conduit and the outlet box, conduit or other equipment to which it is connected.

E. Rigid Aluminum Conduit Fittings: Malleable iron, steel or aluminum alloy. Ferrous fittings zinc coated or cadmium plated. Aluminum alloy fittings shall conform with the characteristics defined by UL for aluminum rigid metallic conduit and shall not contain more than 0.04 percent copper.

F. Flexible Conduit Fittings (Commercial Greenfield): Either steel or malleable iron only, with insulated throats and shall be one of the following types:
1. Wedge and screw type with angular wedge fitting between the convolutions of the conduit.
2. Squeeze or clamp type with bearing surface contoured to wrap around the conduit and clamped by one or more screws.
3. Steel, multiple point type, for threading into internal wall of the conduit convolutions.

G. Expansion Fittings: Each conduit that is buried in or rigidly secured to the building construction on opposite sides of a building expansion joint and each long run of exposed conduit that may be subject to excessive stresses shall be provided with an expansion

fitting. Expansion fittings shall be hot dipped galvanized malleable iron with factory installed packing and a grounding ring.

H. Sealing Fittings: Threaded, zinc or cadmium plated, cast or malleable iron type for steel conduits and threaded cast aluminum type for aluminum conduits. Fittings used to prevent passage of water vapor shall be of the continuous drain type.

I. Fittings for PVC Coated Rigid Steel Conduit: Ells and couplings used with PVC coated rigid steel conduit shall have a factory applied coating of polyvinyl chloride, minimum 15 mills (0.015) on exterior surfaces and shall have a PVC sleeve extruded a minimum of 2" from one end of the fitting.

2.3 WIREWAYS

A. Square-D Company Square-Duct "lay-in" type without knockouts with lengths and fittings hinged to provide an unobstructed wireway to "lay-in" conductors. Use standard lengths. Field cuts permitted where absolutely necessary. Rust inhibiting phosphatizing coating on sheet metal parts. Blue gray baked enamel finish. Hardware plated to prevent corrosion. Provide all accessories, including tee fittings, junction boxes, cross fittings, transposition section, gusset brackets, nipples, pull boxes, reducer fittings, wall flanges, panel or cabinet flanges, elbows, ceiling and wall support brackets and supporting hardware, etc.

2.4 BUSSED GUTTER

A. Bussed gutter shall be amperage, voltage, and phase configuration as noted on the drawings, with a 50% ground bus. Provide lugs on bus bars as indicated on the drawings. All bus bars shall be copper. Use of aluminum bus bars will not be permitted.

2.5 OUTLET BOXES

A. Construction: Zinc coated or cadmium plated steel boxes of a class to satisfy the condition at each outlet except where unilet or condulet bodies are required. Knockout type with knockouts removed only where necessary to accommodate the conduit entering. Square cornered, straight sided gang boxes, 4 inch octagon concrete rings and 4 inch octagon hung ceiling boxes with bars may be folded type. One piece deep drawn type for all other boxes.

B. Size: To accommodate the required number and sizes of conduits, wires and splices in accordance with NEC requirements, but not smaller than size shown or specified. Standard concrete type boxes not to exceed 6 inches deep except where necessary to permit entrance of conduits into side of boxes without interference with reinforcing bars. Special purpose boxes shall be sized for the device or application indicated.

C. Fixture Studs: 3/8 inch malleable iron fixture stud in outlet boxes for ceiling lighting fixtures and interior bracket lighting fixtures, other than lamp receptacles and drop cords.

D. Exposed: Screw joint type, with gasketed weatherproof covers in locations exposed to the weather. Shall be of the continuous drain type. Where required to be "Raintite."

E. Tile Boxes: Rectangular in shape with square corners and straight sides for receptacles and switches mounted in furniture cabinets or in glazed tile, concrete block, marble, brick, stone or wood walls. Install without plaster rings.

F. Wall Mounted Switch, Receptacle and Signal Boxes: Unless otherwise noted or specified, not less than 4 inches square by 1-1/2 inches deep for single devices, 4-11/16 inches by 1-1/2 inches deep for two devices and multi gang boxes for more than two devices. Boxes for switches and receptacles on unfinished walls may be screw joint type with covers to fit the devices. Provide plaster rings, as required, to provide proper opening for device.

G. Wall Mounted Telephone Outlet Boxes: 4-11/16 inches square by 2-1/8 inches deep, unless otherwise noted on the drawings.

H. Light Fixture Boxes: 4 inch diameter by 1.5 inch deep minimum for ceiling and interior bracket fixtures with concealed conduits. Plaster covers for bracket fixtures to have 3 inch diameter openings. Screw joint boxes with canopy seat for ceiling and interior bracket fixtures with exposed conduits.

I. Grounding Terminal: Provide a grounding terminal in each box with circuits serving motor driven equipment or receptacles for grounding to a green equipment ground conductor. Grounding terminal shall be green colored washer-in-head machine screw.

2.6 PULLBOXES

A. Minimum NEC requirements unless larger box is noted. As specified for outlet boxes with blank cover for pullboxes with internal volume not more than 150 cubic inches. As specified for cabinets for pullboxes with internal volume over 150 cubic inches, except covers to have same thickness as box with corrosion resistant screw or bolt attachment.

2.7 FLOOR BOXES

A. Heavy duty, cast, adjustable type, suitable for the device or application indicated, unless noted. Provide carpet flanges in carpet areas.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION

A. Conduit Systems: Conduit shall be provided for all wiring circuits. Material shall be exposed or concealed as required by the Drawings. Rigid Steel conduit, IMC, EMT or Rigid Non-Metallic conduit unless noted. Install rigid steel conduits for underground runs, when specifically noted on the drawings, runs in concrete, feeder circuits and where required by the NEC for mechanical protection, etc. Use flexible conduit only for equipment connections and then only to the extent of minimum lengths required for connections (Typically 1'-0", maximum length 4'-0"). Install flexible conduit connections at all resilient mounted equipment. Provide liquid tight flexible conduit in exterior, wet or damp locations and for connections to all motors, dry type transformers and wet pipe mechanical systems. Aluminum conduit may be used only if specifically called for. Conduit and tubing shall be kept at least 6 inches from parallel runs of hot water or steam pipes. PVC conduit may be used only for runs below grade or in slab.

Concrete encasement is required under all paved areas. Rigid steel, galvanized elbows shall be used for all bends and risers. No PVC shall be extended above grade or slab. Ground wires, sized in accordance with NEC, shall be installed in all conduit runs, except where used for telephone conductors.

B. Conduit Installation: Install concealed conduit and EMT in as direct lines as possible. Install exposed conduits and EMT parallel to or at right angles to the lines of the building. Right angle bends in exposed conduit and EMT runs shall be made with standard elbows, screw jointed conduit fittings or conduit bent to radii no less than those of standard elbows. Exposed conduits below the five (5) foot level shall be galvanized rigid conduit.

C. Concealed Conduits: Install conduit systems concealed where possible unless otherwise noted. Conduit systems may be exposed in unfinished utility areas, ceiling cavities and where specifically approved by the Engineer. No conduit shall be run on roof or exposed face of building unless specifically shown on plans or approved by Engineer.

D. Conduit in Concrete: Conduits shall not be installed in floor slabs poured on grade. Conduits under slab shall be installed a minimum 6” below slab, covered with earth. PVC coated rigid steel conduit may be embedded in above grade concrete providing the outside diameter does not exceed 1/3 thickness of concrete slab, wall or beam, is located entirely within the center third of the member and lateral spacing of conduit is not less than 3 diameters.

E. Conduit in Ground: PVC schedule 40 non-metallic conduit may be utilized for all underground runs unless noted otherwise on the drawings. Installation and use of PVC shall comply with Article 347 of NEC. All conduit sizes, shown on the plans, shall be increased to accommodate the installation of the equipment grounding conductor. All joints shall be made with solvent cement per manufacturer's recommendations and shall be watertight. Plastic conduit runs stubbing up to above grade junction boxes or conduit runs shall be converted to PVC plastoid coated rigid steel conduit by installing a female adapter, 90 degree PVC coated rigid steel elbow and a PVC coated rigid steel nipple of length as required to stub conduit up. No plastic conduit shall be installed above grade. Plastic conduit shall be used for straight runs only. PVC coated rigid steel conduit shall be used for all bends, ells and offsets. Where rigid galvanized steel conduit is in contact with dirt, soil, fill or earth, conduits shall be field wrapped with one layer of 3M Scotch 50 plastic tape with a 50% overlap, including all joints or couplings, or shall be coated with a bonded, 20 mil minimum thickness PVC, permanently fused at the factory, Pittsburgh Standard Co. "PlastiBond," or approved equal. All fittings, couplings, ells, etc., used with PVC coated conduit shall have same factory applied PVC coating. An equipment grounding conductor, in accordance with NEC, shall be installed in all conduits. Minimum burial depth of conduits or ducts shall be as follows:

Power: Primary (above 600v.), 42"
Secondary (below 600v.), 36"
Telephone: 24"

F. Conduit Bends: In any conduit or EMT run, the number of quarter bends or equivalent between terminations at cabinets or boxes shall not exceed four bends. Conduit runs between cabinets or boxes shall not exceed 200 feet for straight runs nor 100 feet for runs with maximum number of bends. Bends in telephone and data conduits shall be long sweeping bends.

G. Conduit Openings: Protect all vertical runs of conduits or EMT terminating in the bottoms of boxes or cabinets, etc., from the entrance of foreign material prior to installation of conductors.

H. Roof Penetrations: All roof penetrations shall be sealed as called for in the architectural plans and specifications.

I. Pull Cords: The Contractor shall furnish and install a full length, 3/32" nylon pull cord in every "empty" conduit installed hereunder to facilitate the future installation of wires. Identify each terminus of pull wire with linen tags with complete information as to service and location of the terminus of the cord.

J. Sealing Fittings: Install where required by the NEC, where conduits pass from warm to cold locations and where otherwise indicated.

K. Sleeves for Conduit: Install sleeves for conduit where shown or as required. Conduit sleeves not used shall be plugged with recessed type plugs. Sleeve all conduit passing through walls. Sleeves that are used shall be caulked tight with lead yarn.

L. Identification: Identify all exposed raceways according to the system carried. Identify exposed conduits 3/4 inch or larger in diameter by means of painted-on stencils, and conduits less than 3/4 inch in diameter with enameled-on metal tags. Provide legible lettering in contrasting colors. Abbreviate only when approved. Identification shall be placed at maximum intervals of twenty feet on straight conduit runs, close to all terminations, adjacent to all change in directions and where conduits pass through walls or floors. In general, use yellow color. Painting shall be in accordance with DIVISION 9 - FINISHES.

3.2 CONDUIT SUPPORTS

A. Supports: Provide supports for horizontal conduits and EMT not more than 8 feet apart with not less than two supports for each 10 foot straight length and one support near each elbow or bend including runs above suspended ceilings and within 3 feet of all junction boxes, switches, fittings, etc.

B. Straps: Install one hole pipe straps on conduits 1.5 inch or smaller. Install individual pipe hangers for conduits larger than 1.5 inch. Spring steel fasteners with hanger rods may be used in dry locations in lieu of pipe straps.

C. Trapezes: Install multiple (trapeze) pipe hangers where two or more horizontal conduits or EMT run parallel and at the same elevation. Secure each conduit or EMT to the horizontal hanger member by a U-bolt, one hole strap or other specially designed and approved fastener.

D. Hanger Rods: Install 1/4 inch diameter or larger galvanized steel rods for trapezes, spring steel fasteners, clips and clamps. Wire or perforated strapping shall not be used for the support of any conduit or EMT.

E. Fastening: Fasten pipe straps and hanger rods to concrete by means of inserts or expansion bolts to brickwork by means of expansion bolts and to hollow masonry by means of toggle bolts. Wooden plugs and shield shall not be used. Power driven

fasteners may be used to attach pipe straps and hanger rods to concrete only where approved by the Engineer.

F. All conduits not embedded in concrete shall be firmly secured by means of pipe clamps, hangers, etc., equal to Caddy fasteners of ERICO Products, Inc. Wire wrapped around conduits and supporting members will not be accepted.

G. On Roof: All conduits laid on roof shall be supported on 4" redwood blocks, mopped into roof and spaced at 5'-0" on center.

H. Lay-in Ceiling: Conduits routed above acoustical "lay-in" ceilings shall be anchored to the building structure and not laid on the ceiling. Wire shall not be used to anchor boxes to structure. If ceiling support system is adequate, one 3/4" maximum conduit may be supported by a Caddy Clip to hanger wire. Multiple runs of conduit shall be racked on trapeze hanger. All support materials shall be rustproof. Perforated tape or soft iron wire shall not be used.

3.3 CONDUIT STUB-UPS

A. Conduits run under floor shall be stubbed up to a coupling set flush with floor. This excludes conduits stubbed up in walls and feeder conduits. Install flush plug until after floor is finished, then complete connections to boxes or equipment.

3.4 OUTLET BOXES

A. Outlet Boxes: Outlet boxes, covers and fittings, according to the particular use for which they are required, shall be provided in the locations marked on the drawings by symbols, and/or for use to facilitate the installation of the electrical systems. When necessary, outlets shall be relocated so that when fixtures of other fittings are installed they will be symmetrically located according to the room layout and will not interfere with other work or equipment required by the drawings and/or specifications.

B. Installation: Unless otherwise specified or shown on the drawings, outlet boxes shall be flush mounted and the front edges of the boxes or plaster covers shall be flush with the finished wall or ceiling line or if installed in walls and ceilings of incombustible construction, not more than 1/4 inch back of same. Mount boxes with the long axes of devices vertical, unless otherwise specified. Boxes in plastered walls and ceilings shall be provided with plastic covers. A multiple of box extensions and/or covers will not be permitted. Install in a rigid and satisfactory manner with suitable metal bar hangers, box cleats, adjustable box hangers, etc. Use wood screws on wood, expansion shields on masonry and machine screws on steel work.

C. Mounting Heights: The mounting height of a wall mounted outlet box shall be construed to mean the height from the finished floor to the horizontal center line of the cover plate. On exposed tile, block or brick construction, mount outlet boxes at the nearest bed joint to the mounting height indicated. Wall Mounted Switch, Receptacle and Signal Outlets: On columns, pilasters, etc., mount so the centers of the columns are clear for future installation of partitions. Install outlet boxes near doors or windows close to trim. Install outlet boxes near the doors on the lock sides (see architectural drawings for correct door swings).

D. Identification: Identify all exposed junction boxes according to the system carried by means of painted-on stencils or labels with legible letters and contrasting colors and without abbreviations. In general, use yellow color. Painting shall be in accordance with DIVISION 9 - FINISHES.

3.5 PULLBOXES

A. Provide additional pullboxes wherever necessary to meet requirements for maximum length of conduit runs and maximum numbers of bends.

3.6 FLOOR BOXES

A. Install level with top covers adjusted flush with finished floor or floor tile.

3.7 FIXTURE CONNECTIONS

A. Recessed or surface light fixtures in lay-in or accessible ceilings shall be connected with minimum 1/2 inch flexible metallic conduit, 4 to 6 feet long with grounding provisions.

3.8 CLOSING OF OPENINGS

A. Wherever slots, sleeves or other openings are provided in floors or walls for the passage of conduits or other forms of raceway, such openings, if unused, or the spaces left in such openings, shall be filled or closed in an approved manner.

3.9 IDENTIFICATION

A. Refer to Section 260500 - General Electrical Provisions for identification requirements for raceways and boxes.

END OF SECTION

SECTION 26 0536

CABLE TRAY

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Furnish and install a complete cable tray system as specified herein. System shall be complete with all supports, mounting devices, etc., as required.

1.2 SUBMITTALS

A. Submit complete shop Drawings with outline dimensions, special installation instructions, materials list, catalog cuts, descriptive literature and complete description of the cable tray system. Complete layout indicating all connections, locations and mounting shall be submitted.

PART 2 - PRODUCTS

2.1 GENERAL

A. Cable trays shall form a wireway system and shall be of nominal 4 inch depth of aluminum. Wireways shall include splice, end plates, dropouts, and miscellaneous hardware. Wireways shall be supported at not more than 3'-6" intervals unless otherwise indicated. Contact surfaces of aluminum connections shall be coated with an antioxidating compound prior to assembly. All edges, fittings and hardware shall be finished free from burrs and sharp edges. Fittings shall have manufacturer's minimum standard radius unless otherwise indicated.

B. Ladder type cable trays shall be of nominal 12 inch width. Rung spacing shall be 6" maximum centers.

C. Cable trays run through smoke and fire partitions shall be sealed to preserve the smoke and fire rating of the partitions.

D. A no. 2 AWG bare copper or electrical equivalent aluminum conductor shall be laid throughout the cable tray system and bonded to each section thereof. This conductor shall be connected to the building grounding system as required. Bonding of the No. 2 conductor to the cable tray system shall be made by bolted or thermochemical type connections.

E. Cable tray system (tray, mounting brackets, anchors etc.) shall carry a live load of 60 lbs. per lineal foot with a minimum safety factor of 1.5, NEMA class 12C minimum.

PART 3 – EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Cable tray shall be securely and rigidly fastened in place with approved pipe straps, wall brackets, clamps, fasteners, hangers, threaded C-clamps with retainers, or ceiling trapeze.

Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structures.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Underground warning tape.

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; Latest Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 70E - Standard for Electrical Safety in the Workplace; latest edition.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 – PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

B. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchboards:
         1) Identify voltage and phase.
         2) Identify power source and circuit number. Include location when not within sight of equipment.
         3) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      c. Panelboards:
         1) Identify voltage and phase.
         2) Identify power source and circuit number. Include location when not within sight of equipment.
         3) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
         4) For power panelboards without a door, use identification

nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

d. Transformers:
   1) Identify power source and circuit number. Include location when not within sight of equipment.

e. Enclosed switches, circuit breakers, and motor controllers:
   1) Identify voltage and phase.
   2) Identify power source and circuit number. Include location when not within sight of equipment.

f. Busway:
   1) Identify power source and circuit number. Include location when not within sight of equipment.
   2) Provide identification at maximum intervals of 40 feet (12 m).
   3) Use identification nameplate to identify load(s) served for each plug-in unit. Include location when not within sight of equipment.

g. Enclosed Contactors:
   1) Identify voltage and phase.
   2) Identify load(s) and associated circuits controlled. Include location.

2. Service Equipment:
   a. Use identification nameplate to identify each service disconnecting means.
   b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
   c. Use identification nameplate at each piece of service equipment to identify the available fault current and the date calculations were performed.

3. Emergency System Equipment:
   a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
   b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.

4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

5. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
   a. Minimum Size: 3.5 by 5 inches.
   b. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash hazard study performed in accordance with Section 26 0573:
      1) Include orange header that reads "WARNING" where calculated incident energy is less than 40 calories per square cm.
      2) Include red header that reads "DANGER" where calculated incident energy is 40 calories per square cm or greater.

3) Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.

C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less as follows:
a. The phasing of all conductors (#8 and larger) shall be identified by color coding tape. Conductors sizes #10 and smaller shall have colored insulation. The grounded (neutral) conductor sizes #6 and smaller shall be white or light gray or have 3 continuous white stripes on other than green insulation. Grounded (neutral) conductors larger than size #6 shall be color coded white with coding tape. Grounding conductors sizes #6 and smaller shall have green insulation or be bare the entire length. Grounding conductors larger that size #6 shall be color coded green with coding tape.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

D. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.
a. Color-Coded Boxes: Field-painted in accordance with Section 09 9000 per the same color code used for raceways.
1) Fire Alarm System: Red.

E. Buried Electrical Lines: Underground warning tapes.

F. Communication Cabinets: Nameplates.

G. Control Device Station: Labels.

H. Electrical Distribution and Control Equipment Enclosures: Nameplates.

I. Junction Box Load Connections: Wire markers.

2.2 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

C. HellermannTyton: www.hellermanntyton.com.

2.3 IDENTIFICATION NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background, unless indicated otherwise for nameplates for Essential Power System equipment.
1. Engraving stock shall be melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

2. Nameplates and labels shall have punched or drilled holes for mechanical fasteners.
3. Nameplates and labels shall be fastened using self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts with flat and lock washers.

B. Locations:
1. Each electrical distribution (switchboards, distribution panels and panelboards) and control equipment enclosure.
2. Communication cabinets.
3. All special systems cabinets.

C. Letter Size:
1. Use 1/8 inch letters for identifying individual equipment and loads.
2. Use 1/4 inch letters for identifying grouped equipment and loads.

D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations, and identified specialized power devices.

2.4 WIRE AND CABLE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com.
2. Seton Identification Products: www.seton.com.
3. HellermannTyton: www.hellermanntyton.com.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

G. Description: Vinyl cloth type self-adhesive wire markers.

H. Locations: Each conductor at panelboard gutters, pull boxes, and junction boxes each load connection.

2.5 UNDERGROUND WARNING TAPE

A. Manufacturers:
1. Brady Corporation: www.bradyid.com.
2. Seton Identification Products: www.seton.com.
3. HellermannTyton: www.hellermanntyton.com.

B. 4" Polyethylene tape, Foil-backed Detectable Type Colored Red Tape: 4" inches wide, with minimum thickness of 4 mil, with suitable warning legend describing buried electrical lines.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

A. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker.

B. Install line marker for underground wiring, both direct buried cables and cables in raceway.

C. Paint fire alarm junction boxes red.

D. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout.

E. Electrical Gear and Equipment Identification Labels: Engraved plastic laminate shall be installed on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch-high lettering on 1-1/2-inch-high label. Where two lines of text are required, use labels that are 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of electrical gear and equipment using mechanical fasteners:

1. Interior and exterior of switchgear, switchboards, distribution panelboards, panelboards, motor control centers, electrical cabinets, enclosures and other equipment.
    a. Main Overcurrent Protection: Identify main device and service disconnects.
    b. Switchboards and Switchgear: Identify equipment, label main and distribution overcurrent protection showing load served and location (identify room numbers, where possible).
    c. Distribution Panelboards: Identify Distribution Panelboard designation and circuit serving distribution panelboard. Label main and distribution overcurrent protection showing load served and location (identify room numbers, where possible).
    d. Branch Panelboards: Identify distribution panel and circuit serving panelboard.
    e. Motor Control Centers: Identify equipment designation, voltage, phases and full-load current capacity. Label main and distribution overcurrent

protection.

f. Disconnect Switches: Identify equipment designation, voltage and horsepower rating or full-load current capacity.

g. Enclosed Circuit Breakers: Identify equipment designation, voltage and full-load current capacity.

h. Motor Starters: Identify equipment designation, voltage and horsepower rating or full-load current capacity.

i. Power Transfer Equipment (Manual and Automatic): Identify equipment designation, power sources, voltage and full-load current capacity.

2. Identification Labels for Other Electrical Equipment: Engraved plastic laminate shall be installed on each unit of equipment. Unless otherwise indicated, provide a single line of text with 1/2-inch-high lettering on 1-1/2-inch-high label. Where two lines of text are required, use labels that are 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of electrical gear and equipment using mechanical fasteners:

a. Transformers.
b. Frequency converters.
c. Power inverters.
d. Lighting contactors.
e. Push-button stations and other control stations or devices.
f. Telephone switching equipment.
g. Battery racks.
h. Power-generating units.
i. Nurse call system master station.
j. Paging system master station.
k. TV/audio-monitoring master station.
l. Fire alarm system master station or control panel.
m. Fire alarm system extender or battery panel.
n. Security-monitoring master station or control panel.
o. Master clock or program equipment.

F. Provide framed, typed circuit schedules for all panelboards with explicit description and identification of items controlled by each individual circuit breaker.

1. Existing Panelboards: Identify existing circuits as well as new circuits with new, typed circuit schedules.

a. 208 Volt System: Black
b. Other Special Systems: Yellow.

G. Circuit Identification Labels: Provide external labels for all installed device face covers and junction boxes prior to installation of conductors. Circuit identification shall be as shown below.

1. Labeling Legend for Junction Boxes: Provide permanent, waterproof label listing panel and circuit number.
2. Labeling Legend for Device Face Covers in Patient Care Areas, as defined by NEC Article 517: Provide permanent, adhesive label listing the panel and circuit number.
3. Circuit Identification Labels on Cover or Face Plates: Install labels externally for all installed wiring device plates indicating panel and circuit number.

a. Clear preprinted adhesive labels.

H. Color-Coding for Secondary Phase Conductors: Color code switch legs, travelers and other wiring for branch circuits other than those listed below. Permanently post color code at each branch panelboard. Use the following colors for service, feeder and branch-circuit phase conductors: (Ref: NEC # 210.4, 200.6, 250.119.)
   1. 208/120-Volt, 3-Phase System Conductors:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
      d. Neutral (Common): White.
      e. Ground (Earth): Green.
   2. 480/277-Volt, 3-Phase System Conductors:
      a. Phase A: Brown.
      b. Phase B: Orange.
      c. Phase C: Yellow.
      d. Neutral (Common): Gray.
      e. Ground (Earth): Green.

I. Circuits Operating at More Than 600 Volts: Identify raceway and cable with "DANGER--HIGH VOLTAGE" in black letters 2 inches high, stenciled with paint at 10-foot (3-m) intervals over a continuous, painted orange background. Identify the following:
   1. Entire floor area directly above conduits running beneath and within 12 inches of a basement or ground floor that is in contact with earth or is framed above unexcavated space.
   2. Wall surfaces directly external to conduits concealed within wall.
   3. All accessible surfaces of concrete envelope around conduits in vertical shafts, exposed in the building, or concealed above suspended ceilings.
   4. Entire surface of exposed conduits.

J. Electrical identification in healthcare facilities shall comply with the following requirements:
   1. All electrical outlets in patient care areas, as defined in NEC 517, shall have a permanent label affixed to the faceplate cover indicating the panel name and circuit number feeding that outlet.
   2. All electrical switches in patient care areas, as defined in NEC 517, shall have a permanent label affixed to the faceplate cover indicating the panel name and circuit number feeding that outlet.
   3. Labeling on faceplate covers in Critical Care Units (CCU), Neonatal Intensive Care Units (NICU's), Intensive Care Units (ICU's), Operating Rooms (OR's) and other similar areas in healthcare facilities shall be accomplished by permanently engraving the faceplate cover with the panel name and circuit number feeding that outlet or switch.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section

1.2 DESCRIPTION OF WORK

A. Furnish and install complete, all panelboards.

1.3 RELATED WORK IN OTHER SECTIONS

A. Cabinets; Motor & Circuit Disconnects; Fuses; Service and Distribution; Grounding; Conductors, Raceways, Boxes and Fittings.

1.4 SUBMITTALS

A. Submit complete shop drawings with outline dimensions, descriptive literature and complete descriptions of the frame size, trip setting, class and interrupting rating of all overcurrent devices. Identify available spaces. Complete description of physical layout of panelboards showing conformance with drawings.

PART 2 - PRODUCTS

2.1 GENERAL

A. Dead front, safety type, with voltage and amperage ratings as scheduled. Panelboards shall be of the type required for the short circuit and duty ratings indicated on the drawings or specified. All panelboards shall have a neutral bus and an insulated ground bus. Panelboards shall be as manufactured by General Electric, Cutler-Hammer or Square D and shall be as scheduled.

2.2 CABINETS

A. Each panelboard shall be enclosed in a sheet metal cabinet with front doors, catches, locks, etc., as specified in Section 262716, Cabinets.

B. Door-in-Door: Both surface and flush panels shall be door-in-door. The door over the interior of the panel shall be provided with hinges and combined lock and latch. The outside door over the panel gutters shall be provided with hinge(s) on one side and combined lock and latch. Machine screws into threaded holes in the panelboard cabinet, in lieu of combined lock and latch, to secure the outside door are not acceptable.

2.3 FUSIBLE PANELBOARD

A. Fusible panelboards shall be factory assembled, Each fused switch shall have an etched micarta nameplate secured by two cadmium plated screws. The panelboard shall have a neutral bus and a ground bus connected with a removable link.

General Electric	"QMR" up to 1200 amps
Square D	"QMB" up to 1200 amps

B. Quick-make, quick-break fusible switch units to be of type with external operating handle suitable for padlocking in OFF position. Provide interlock to prevent opening cover when switch is in ON position unless interlock release is operated. Provide frame and fuse clip ratings as indicated in the panelboard schedules. Switch and fuse holder shall be rated for 200,000 amp interrupting capacity. Fuse holders shall be provided with Class R rejection feature.

C. Fuses shall be provided for all switches. Fuses for switches serving motors shall be Bussman Fusetrons, sized for heavy service motor running protection. Fuses for other services shall be as designated on the drawings. Proper fuse amp ratings shall be indicated on inside of switch cover, through the use of "Tapewriter" and should read "Use Fusetrons Only" (indicate amperage size as shown on plans).

D. Space Only: Where "space only" in noted on the drawings, provide necessary connectors, mounting brackets, etc., for the future insertion of an overcurrent device. Spaces shall be sized 200 amps unless noted otherwise.

2.4 CIRCUIT BREAKER PANELBOARDS

A. Panelboard interiors shall be constructed on pre-drilled and tapped channel rails. Main busses shall be pre-drilled and tapped to accommodate any combination of circuit breaker units without further modification. All panelboards shall be complete with doors. Units shall be complete with combination latch and cylinder locks. All locks shall be keyed alike. All bussing shall be of the "sequence type". All connections shall be bolted.

B. Circuit breakers shall be molded case type (minimum 10,000 amp interrupting capacity, larger as required). All multi-pole breakers shall have a common trip and all breakers shall be interchangeable in any combination of poles with the same frame size. All branch circuit straps shall have the capacity of the maximum breaker size in the frame space (i.e. 100 amp strap for 100 amp frame). Minimum 100 amp straps will be accepted.

C. All main and branch breakers shall be of the size and have the interrupting rating scheduled on the Drawings. All incoming and outgoing terminals shall have solderless lugs. Provide, where required, lug landing to accommodate number and size conductors shown on the Power Riser. Panelboards shall be factory assembled.

D. Single pole circuit breakers shall be suitable for switching duty and marked "SWD".

E. Bolted Type: Circuit breaker current carrying connections to the bus shall be of the bolted type, factory assembled. Stab in type not permitted. Provide bus bars for three phase panelboards of the sequence phased type connection and arranged for 3 phase, 4 wire mains, unless otherwise indicated on the drawings.

F. Space Only: Where "space only" is noted on the drawings, provide necessary connectors, mounting brackets, etc., for the future insertion of an overcurrent device. Provide blank cover for each space.

G. Directories: Provide typewritten circuit descriptions referencing permanent room numbering assigned in lieu of the room numbering shown on the drawings.

H. Spare Conduit: Provide three spare 1" conduits for each panel. Extend empty conduit with pullwire into accessible ceiling space and stub-out for future use.

2.5 NAMEPLATE

A. Labels for identifying the breakers shall be engraved laminated plastic strips attached by screws (see "Nameplates" Specifications in Section 260500) or labels supplied by Panel Manufacturer.

B. Nameplates on Panelboards shall give voltage characteristics phase and number of wires. Example: Panel A, 120/208V, 3 phase, 4W.

C. Individual circuit breakers or switches, panelboards, disconnect means and motor starters shall have nameplate showing the load served.

D. Blank name plates shall be mounted on each "spare" unit or on "space" in distribution panels.

2.6 SKIRTS

A. Where noted on the drawings panelboards shall be skirted with complete metal enclosures and barriers separating the panel interior.

2.7 BUS BARS

A. All bus bars shall be copper. Use of aluminum bus bars will not be permitted.

2.8 CONNECTORS AND LUGS

A. Contractor shall review one-line and other Drawings to assure that proper lugs are provided in termination equipment such as switches, panels, switchboards, mechanical equipment, etc. Due to voltage drop conductor sizes and/or numbers may not be accommodated by the equipment affected. If manufacturer cannot provide the proper number and size of lugs within their equipment the Contractor shall provide enclosures and properly sized terminals to convert the oversized cable, number and size that is compatible to the equipment affected.

PART 3 - EXECUTION

3.1 PANELBOARDS

A. Panelboards shall be located where indicated on the drawings. Panelboards shall have neatly typed circuit directories behind clear plastic. Identify circuits by area designations and use. "Spare" and "Space" shall be indicated with erasable pencil, not typed.

B. Circuiting of all branch circuits shall be as designated on the drawings. Breaker and switch arrangement in panels shall be exactly as specified and all circuits will terminate in the positions indicated.

3.2 PHASE ROTATION

A. Phase A, left bus; phase B, center bus; phase C, right bus (front viewing).

END OF SECTION

SECTION 26 2716

CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish and install cabinets for panelboards, telephone, and communication systems as required.

1.3 RELATED WORK IN OTHER SECTIONS

A. Panelboards, sound systems, telephone systems.

PART 2 - PRODUCTS

2.1 GENERAL

A. Sheet steel code gauge, galvanized cabinets with painted fronts and trim. Those exposed to wet or rain conditions shall be "raintight" unless otherwise noted. Cabinets without through feeder wiring shall be arranged to provide a wiring gutter not less than 4 inches wide for branch circuit panelboards served by feeders up to 4/0. Panelboards served by feeders in excess of 4/0, up to and including 750 kcmil, shall be provided with top, bottom and side gutters 8 inches wide. Cabinets shall be of standard make and shall bear the Underwriters Laboratories label. All outside surfaces of trim and doors shall be given a factory finish coat of No. 61 ANSI gray paint, or approved manufacturer's standard. Cabinets for telephone and communications systems shall have 5/8 inch exterior grade, one-face B-grade or equal flame proofed plywood backboard inside with maximum height and width.

2.2 FEED-THROUGH GUTTERS

A. Where feeders go through panelboard cabinets to serve panelboards above or beyond, the wiring gutters in panelboard cabinets shall be a minimum of 8 inches on sides, top and bottom.

2.3 TRIM

A. One-piece, sheet steel trim with hinged door with catch and lock. One piece sheet steel with 3/4 inch flange around all edges shaped to cover edge of box. For telephone or communication cabinets trims with captive nuts or clamps. Trims shall be furnished with indicating adjustable trim clamps for panelboards.

2.4 DOORS

A. Doors shall close against a rabbet placed all around the inside edge of the frame with a close fitting joint between door and frame. The doors shall be fitted with substantial flush hinges placed not over 24 inches apart, nor more than six inches from ends of doors, and fastened permanently to the door and frame with round-headed rivets or spot welds, or with concealed flush piano hinges. Fastening screws or clamps or trims shall be set not over 24 inches apart. Doors over 48 inches in height shall be equipped with a vault handle and a three-point catch.

2.5 LOCKS

A. Furnish each cabinet with a combination catch and flat key lock. The telephone, electrical and signal cabinet locks shall be fitted to separate keying for each system. Furnish two keys for each cabinet.

2.6 GROUND BAR

A. Each cabinet, for a panelboard, shall be provided with a copper interior ground bar suitably braced or bolted to the cabinet wall. The equipment ground bar shall be equivalent in current carrying capacity to the incoming feeder ground conductor and shall have approved pressure connector terminations for the associated feeders, branch circuits, etc.

PART 3 - EXECUTION

3.1 CABINETS

A. Cables installed in the wiring gutters of cabinets shall be neatly bundled, routed and supported. Minimum bending radii as recommended by the cable manufacturer shall not be reduced. Lighting and power cabinets shall be installed with tops 6'-6" above floor and bottoms not less than 12 inches above floor.

END OF SECTION

SECTION 26 2726

WIRING DEVICES AND PLATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions for the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish and install all wiring devices and plates as required for the complete installation and operation of all systems throughout the project.

1.3 RELATED WORK IN OTHER SECTIONS

A. Conductors, Conduit, Boxes and Fittings.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

A. Unless otherwise specified, each wall switch (flush tumbler-toggle) shall be of the A.C. General use type for mounting in a single gang spacing, fully rated 20 amperes minimum at 120/277 volts, conforming to minimum requirements of the latest revision of the Underwriter's Laboratories, Inc., UL 20 Fifth Edition Standard Snap Switches and further requirements herein specified. Specification grade, heavy duty, single pole, 3-way or 4-way, of the maintained, momentary or lock type as indicated on the drawings. Switches shall operate in any position and shall be fully enclosed cup type with entire body of molded phenolic, urea or melamine with cover of molded phenolic, urea or melamine. Fiber, paper or similar insulating material shall not be used for body or cover. Ivory color handles unless otherwise indicated. Silver or silver alloy contacts. A.C. 120/277 volt general use snap switches shall be capable of withstanding tests as outlined in NEMA Publications and shall be as follows unless otherwise noted:

Switch	Hubbell	P & S	Bryant	Leviton
1P	1221-I	20-AC-1-I	4901-I	1221-I
2P	1222-1	20-AC-2-I	4902-I	1222-I
3-Way	1223-I	20-AC-3-I	4903-I	1223-I
4-Way	1224-I	20-AC-4-I	4904-I	1224-I
3-pos. 2 cct maintained	1385-I	1225-I	4922-I	
3-pos. 2 cct momentary	1557-I	1251-I	4921-I	
Lighted handle pilot lgt.	1221-PL	2251-SP	4901-PL	1220-PL

2.2 RECEPTACLES

A. General: Configuration and requirements for all connector or outlet receptacles shall be in accordance with NEMA Publications. Fire resistant, non absorptive, hot welded, phenolic composition or equal bodies and bases with metal plaster ears (integral with the supporting member). Single or duplex as shown or noted on drawings. Ivory color unless otherwise noted on the drawings. Double grip contacts for each prong.

B. Grounding Type: All receptacles shall be grounding type with a green colored hexagonal equipment ground screw of adequate size to accommodate an insulated grounding jumper (based on Table 250-95 of the NEC with minimum size No. 14 AWG). Grounding terminals of all receptacles shall be internally connected to the receptacle mounting yoke. Unless otherwise noted, receptacles shall be as follows:

Receptacle	Hubbell	P & S	Bryant
20A-125V AC 2P 3W	5362-I	6300-I	5362-I
20A-208V AC 4P 4W	7250	7250	7250
30A-250V AC 3P 3W	9350	L1030R	9303
30A-600V AC 4P 4W	3430	3430	3430
Special	Receptacles for special applications shall be as indicated on the drawings.		

2.3 PLUG CAPS

A. Except for duplex receptacles, and cleaning combination receptacles one matching plug cap shall be provided for each receptacle. No plug caps are required for duplex receptacles. Provide watertight, male plug caps in damp locations or where exposed to weather.

2.4 DEVICE PLATES

A. General: Provide plates for each switch, receptacle, signal and telephone outlet and special purpose outlet. Do not use sectional gang plates. Provide multi gang outlet plates for multi gang boxes. All plates on finished walls shall be Leviton #84000-40 series, stainless steel. Screws shall be of metal with countersunk heads with finish to match the finish of the plate. Device plates shall be of the one-piece type, of suitable shape for the device to be covered.

B. Exposed: Plates for exposed screw jointed fittings shall match the fittings with edges of plates flush with edges of fittings. To be heavy cadmium plates, steel, with gasket. Plates for cast type boxes at locations subject to wet or rain conditions, shall be of the cast, vapor tight type. Provide hinged lift covers for devices.

C. Communications: Plates for telephone and signal outlets shall each have a 3/8 inch bushed opening in the center. Wall plates for push button and buzzer outlets shall have openings to suit the push buttons and buzzers.

D. Plates for special purpose outlets shall be of a design suitable for the particular application.

2.5 CLOCK OUTLETS

A. Flush, single receptacle, regressed in stainless steel device plat.

2.6 REMOTELY CONTROLLED SWITCHES OR RELAYS

A. Electro-magnetically operated, mechanically held with clearing contacts for maintained contact control unless otherwise required. Rugged construction conforming to NEMA and IEEE test standards for industrial type power relays and the requirements of UL 508, Standards for Safety Industrial Control Equipment. Ratings as indicated on the drawings suitable for the application. Contacts shall be double break renewable, solid wiping type, silver-to-silver Tungsten alloy, self-aligning, quick-make, quick-break, with a minimum inductive load rating of 20 amps. Relays shall be as manufactured by Allen-Bradley, Cutler-Hammer, General Electric, Square D or Westinghouse, equal to Allen-Bradley Bulletin 700 Control Relays. Provide sound deadening mounting and enclosure.

2.7 MOMENTARY CONTACT SWITCHES

A. Tumbler type single pole double throw momentary contact for 3 wire circuit, with Off position when tumbler handle is in the center, similar in appearance to the conventional snap switch. Handle or key operated as indicated on drawings. 15 ampere at 120/277 volts for control of 30, 60, or 100 ampere remotely controlled switches or relays rated 101 amperes and above. Provide nameplate to identify the circuit or equipment controlled.

PART 3 - EXECUTION

3.1 OUTLET LOCATIONS

A. Shall be as indicated on the drawings. Align devices and plates horizontally and vertically.

B. It shall be the responsibility of the Contractor to determine from the architectural drawings and by actual determination on the site, the exact location of each and every outlet. The outlet locations shall be modified from those shown on the plans to accommodate changes in door swings or to clear other interferences that may arise from job construction details as well as modifications within room spaces. These modifications shall be made with no change in contract price and shall be a matter of job coordination at the expense of the Contractor. The Contractor shall check these conditions throughout the entire job and shall notify the Architect/Engineer of discrepancies as they occur before proceeding with the installation of the work to verify the modifications, if any. Wall boxes shall be set in advance of wall construction, shall be blocked in place and secured. All wall boxes shall be set flush with finished building construction and the Contractor shall furnish and install extension sleeves as required to extend boxes to the finished surfaces of special furring. No switches shall be located behind doors without specific written authorization by the Architect.

3.2 YOKES

A. Wiring device yokes shall be installed in physical contact with the plaster ring. Where the above contact cannot be obtained, a green covered bonding conductor shall be installed.

3.3 PLATES

A. Shall be installed with all four edges in continuous contact with finished wall surface without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed vertically and with an alignment tolerance of 1/16".

B. Device cover plates for each and every device shall be furnished and installed by this Contractor.

3.4 RECEPTACLES

A. Shall have a separate ground wire from the grounding screw to a grounding stud in the outlet box. All receptacles shall be installed with the "U" slot in the upper position. Substitutions for duplex convenience outlets as listed in 16140 - 2.2 shall only be considered if rated as “Specification Grade”.

END OF SECTION

SECTION 26 2800

MOTOR AND CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish and install complete motor and circuit disconnects for various items requiring them for this project.

1.3 RELATED WORK IN OTHER SECTIONS

A. Conductors, motors, motor starters, motor control centers, panelboards, grounding.

PART 2 - PRODUCTS

2.1 DISCONNECTING MEANS

A. Safety Switches: Fusible Type HD quick break safety switches of the sizes and capacities indicated or required. NEMA 4 Raintight enclosures at locations exposed to the weather.

B. Separately Enclosed Motor Snap Switches: Motor snap switches may be used for motor disconnect means, controller and motor overcurrent protection when applicable. These devices shall be horsepower rated and shall contain motor running overcurrent protection.

2.2 SAFETY TYPE DISCONNECTING SWITCHES

A. Heavy duty, quick make, quick break type, 250-, 480- or 600-volt rating as required for the application. Number of poles and ampacity as noted or required for application or required by code. Fusible with fuse clips suitable for Buss fuses. Short circuit rating of 200,000 RMS Amperes with Class R rejection feature installed in fuseholders. NEMA 1 enclosures for dry locations. NEMA 4 enclosures for wet locations or where exposed to weather unless otherwise noted.

B. Fuses shall be provided for all switches. Fuses for switches at motors shall be Bussman Fusetrons, sized for heavy service motor running protection. Fuses in other locations shall be as designated on the drawings or indicated in Section 262813 of these specifications. Proper fuse amp ratings shall be indicated on inside of switch cover, through the use of "Tapewriter" and should read "Use Fusetrons Only" (indicate amperage size as shown on plans). See Section 262813 for other labeling requirements.

PART 3 - EXECUTION

3.1 DISCONNECT MEANS

A. Install in each location indicated on the drawings and elsewhere as required by NEC.

B. Switches installed outdoors shall be raintight and shall be suitably supported, independently of the item to be served (by unistrut rack) unless sufficient unobstructed flat surface exists on the unit to properly support the electrical equipment.

END OF SECTION

SECTION 26 2810

MECHANICAL AND ELECTRICAL COORDINATION SCHEDULE

PART 1 - GENERAL

1.1 REQUIREMENTS: Conform with applicable provisions of the General Conditions, Supplementary Conditions and General Requirements.

1.2 DEFINITIONS

A. "Furnished by" shall mean that the materials, equipment, wiring, etc. shall be provided to the project by the noted contractor unless specifically noted otherwise in the plans.

B. "Install by" shall mean that the materials, equipment, wiring, labor, etc. shall be installed (mounted in field) at coordinated locations for complete system and shall be completed by the noted contractor unless specifically noted otherwise in the plans.

C. "Control wiring" shall mean that the controls wiring including all supports connections, etc. shall be installed complete by Contractor noted unless specifically noted otherwise in the plans.

D. "Power wiring" shall mean that the power wiring including all supports connections, etc. shall be installed complete by the Contractor noted unless specifically noted otherwise in the plans.

E. "Connected by" shall mean that all required materials and labor shall be provided for the complete installation of all devices and equipment and shall be completed by the noted contractor unless specifically noted otherwise on the plans.

1.3 SCOPE: Make all connections to motors and controls for equipment furnished and/or installed under Division 15 or 16 according to the following schedule unless otherwise noted on the plans:

Item	Furnished By	Installed By	Control Wiring By	Power Wiring By	Connected By
Hydronic Valves	Div. 25	Div. 25			
Hydronic Valves Actuators	Div. 25	Div. 25	Div. 25	Div. 26(e)	Div. 25
Flow Control Regulators	Div. 25	Div. 25	Div. 25	Div. 26(e)	Div. 25
Pneumatic Valve	Div. 25	Div. 25			
Pneumatic Valve Actuators	Div. 25	Div. 25			Div. 25
Volume Control Dampers	Div. 25	Div. 25			
Volume Control Dampers Linkages	Div. 25	Div. 25			
Volume Control Dampers Actuators	Div. 25	Div. 25	Div. 25		Div. 25
Fire/Smoke Dampers	Div. 25	Div. 25			
Fire/Smoke Dampers Linkages	Div. 25	Div. 25			
Fire/Smoke Dampers Actuators/Smoke Detectors	Div. 25	Div. 25	Div. 26 (d)	Div. 26 (e)	Div. 26 (d)
DDC Electronic Thermostats	Div. 25	Div. 25	Div. 25		Div. 25
Pneumatic Thermostats	Div. 25	Div. 25			Div. 25

Item	Furnished By	Installed By	Control Wiring By	Power Wiring By	Connected By
120V Thermostat Backboxes & Wall Conduit	Div. 26	Div. 26			
Pneumatic Tubing Runs	Div. 25	Div. 25			Div. 25
DDC Terminal Controls	Div. 25	Div. 25	Div. 25	Div. 26 (b)	Div. 25
DDC Zone Control Panels	Div. 25	Div. 25	Div. 25	Div. 26 (b)	Div. 25
DDC Backboxes and Cabinets	Div. 25	Div. 25			
Pneumatic Terminal Controls	Div. 25	Div. 25			Div. 25
Pneumatic Zone Control Panels	Div. 25	Div. 25			Div. 25
Duct Smoke Detectors	Div. 25	Div. 25	Div. 26 (d)	Div. 26 (d)	Div. 26 (d)
HVAC Instrumentation (electronic temperature sensors, etc.)	Div. 25	Div. 25	Div. 25	Div. 26 (e)	Div. 25
Equipment Motors	Div. 25	Div. 25	Div. 26	Div. 26	Div. 26
Motor Control Centers with Starters, Overload Heaters, H-O-A Switches, Pilot Lights, Push Buttons, etc.	Div. 26	Div. 26	Div. 26	Div. 26	Div. 26
Motor Starters & Overload Heaters Outside Motor Control Centers	Div. 26 (a)	Div. 26 (a)	Div. 26	Div. 26	Div. 26
Fused & Unfused Disconnect Switches Thermal Overload & Heaters	Div. 26 (a)	Div. 26 (a)	Div. 26	Div. 26	Div. 26
Manual Operating & Multispeed Switches	Div. 26 (a)	Div. 26 (a)	Div. 26	Div. 26	Div. 26
Non-DDC Control Relays	Div. 25	Div. 25	Div. 26	Div. 25	Div. 25
Non-DDC Thermostats, Time	Div. 25	Div. 25	Div. 26	Div. 25	Div. 25
Switches (Low Voltage – Less than Line Voltage					
PE & EP Switches	Div. 25	Div. 25	Div. 25	Div. 25	Div. 25
Pushbutton Stations & Pilot Lights	Div. 26	Div. 26	Div. 25	Div. 26	Div. 26
Fire Protection Sprinkler System Control Supervisory Panels and Devices O.S.0.&Y. Switch, Flow Switch	Div. 25	Div. 25	Div. 26 (d)	Div. 26 (d)	Div. 26 (d)
Heat Taping for Mechanical Systems	Div. 25	Div. 25	Div. 25	Div. 26 (e)	Div. 26 (e)
Fire Alarm Panel and Interfacing with A/C Systems	Div. 26 (d)	Div. 26 (d)	Div. 26 (d)	Div. 26 (d)	Div. 26 (d)
Adjustable Variable Frequency Drives	Div. 25	Div. 26	Div. 25	Div. 26	Div. 26
Non-DDC Control Transformers	Div. 25	Div. 25	Div. 25	Div. 26 (e)	Div. 25
Heat Tape for Roof drains or Gutters	Div. 26	Div. 26	Div. 26	Div. 26	Div. 26

Table Notes:

a) Unless specified to be furnished under Division 15 by the equipment supplier.
b) A dedicated isolated power circuit to Direct Digital Controls (DDC) Central Control Station shall be furnished and installed under Division 16.
c) Smoke damper EP’s and pneumatic actuators shall be wired into the fire alarm system.
d) Performed by the Fire Alarm Sub-Contractor
e) 120V connections by Div. 16

1.4 SUBSTITUTIONS

If the substitution of equipment, devices, or systems furnished under this Division result in changes to the Contract Drawings, Specifications and/or changes to the installation requirements, the complete responsibility and costs shall be assigned to the section of these Specifications under which the equipment is furnished.

1.5 SUBMITTALS

In conjunction with the temperature control, Fire Extinguishing System, and DDC submittals, complete submittal data for each individual Electrically operated or Electrically controlled item of equipment or device furnished under this Division of these Specifications shall include Electrical wiring diagrams and elementary control diagrams (ladder form) showing all internal and external wiring connections and services and shall clearly indicate field wiring furnished and installed under Division 15, differentiated from field wiring furnished and installed under Division 16. The submittal data shall itemize all Electrical characteristics that are of a special nature or critical to the Electrical installation or control system. Such equipment and devices will not be considered for approval until these requirements are met. All submittal data shall be reviewed and approved by the General Contractor, Mechanical, Electrical and Controls Sub-Contractors prior to submission of the complete Temperature Control, Fire Extinguishing System and DDC submittal tot eh Architect. The submittals shall indicate all components that are to be wired into the control power circuit by the Electrical Sub-Contractor, with all terminals for external connections of the components identified and labeled to correspond to the manufacturer's designations. Internal or factory installed wiring of package-type components need not be shown. The Shop Drawings for the system to be installed by the Temperature Controls, Fire Extinguishing System and DDC Sub-Contractors shall be prepared as complete submittals including all wiring requirements as described herein. Color coding designations shall be indicated for the control power circuit wiring.

PART 2 - PRODUCTS

2.1 REQUIREMENTS

The materials, equipment, and devices related to the Electrical System controls are specified under other sections of these Specifications.

PART 3 – EXECUTION

3.1 CHANGES DURING CONSTRUCTION

A. The complete responsibility and costs for revision during construction arising as a result of equipment substitutions, and any resultant changes to the installation requirements, shall be assigned to the respective section of these Specifications, under which the equipment is furnished.

B. In the event of conflict in the delineation of responsibilities for the furnishing and installation of items of Mechanical equipment and the associated control and interlock wiring between Specification 15 and Division 16, Division 15 shall provide the work.

3.2 INSTALLATION

No control work shall be performed until the reviewed and marked submittal data have been reissued to the Contractor, unless written permission is obtained from the Architect.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. Furnish and install all fuses required for the various electrical systems required for this project.

1.3 RELATED WORK IN OTHER SECTIONS

A. Panelboards, motor control centers, motor and circuit disconnects.

PART 2 - PRODUCTS

2.1 FUSES

A. General: Dual element, time delay type, based on heavy service, Buss Fusetron, or equal, unless otherwise noted or required for installation. For individual motor circuit protection, provide fuse sized approximately 125 percent of full load current with 200,000 amperes interrupting capacity.

B. Current-Limiting Fuses: Provide where indicated on the drawings. For non-motor feeder protection in conjunction with fused switches, install NEMA Class L or K Buss Limitron fuses sized 125 percent of load current or as required for coordination with air and molded case circuit breakers.

1. Above 600 amps: Class L, "Hi-Cap" as manufactured by Bussman.
2. Below 600 amps, as required by short circuit duty, Class RK-1, "Limitron" or Class RK-1, "Low Peak" or Class RK-5, "Fusetron" as manufactured by Bussman.
3. All switches having current limiting fuses installed shall have a Lamicoid nameplate with white lettering on red background reading:

   WARNING, REPLACE ONLY WITH CURRENT
   LIMITING FUSES AS ORIGINALLY INSTALLED

C. All fuses shall be rated 200,000 AIC and be of the rejection feature type.

2.2 COORDINATION

A. Coordinate the low voltage fuses required for the project to provide basic selective protection and properly coordinate with the other associated protective equipment.

2.3 FUSE CABINET

A. Provide one wall mounted cabinet for storing all spare fuses. The cabinet shall have a hinged door with latch, with the word "FUSES" stenciled on the front.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate the low voltage fuses required for the project to provide basic selective protection and properly coordinate with the other associated protective equipment.

3.2 SPARE FUSES

A. Furnish one complete spare set (3) of each size and type of fuse required on this project for panelboards, safety switches, and switchboards. Deliver to Owner in the original boxes and store in the fuse cabinet furnished under this Contract.

END OF SECTION

SECTION 263213

ENGINE GENERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes packaged engine-generator sets for standby power supply with the following features:
   1. Diesel engine.
   2. Unit-mounted cooling system.
   3. Unit-mounted and remote-mounted control and monitoring.
   4. Performance requirements for sensitive loads.
   5. Fuel system.
   6. Parallel generator sets.
   7. Load banks.
   8. Outdoor enclosure.

B. Related Requirements:
   1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. EPS: Emergency power supply.

C. EPSS: Emergency power supply system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   2. Include thermal damage curve for generator.
   3. Include time-current characteristic curves for generator protective device.
   4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
   5. Include generator efficiency at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
   6. Include air flow requirements for cooling and combustion air in cfm at 0.8 power

factor, with air supply temperature of 95, 80, 70, and 50 deg F. Provide drawings showing requirements and limitations for location of air intake and exhausts.

7. Include generator characteristics, including, but not limited to kw rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine-generator set and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Seismic Qualification Certificates: For engine-generator set, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails identify center of gravity and total weight including full fuel tank, supplied enclosure, subbase-mounted fuel tank, and each piece of equipment not integral to the engine-generator set, and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Source quality-control reports, including, but not limited to the following:

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017900 "Operation and Maintenance Data," include the following:
      a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
      b. Operating instructions laminated and mounted adjacent to generator location.
      c. Training plan.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: One for every 10 of each type and rating but no fewer than one of each.
   2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
   3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
   4. Tools: Each tool listed by part number in operations and maintenance manual.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Caterpillar, Inc.; Electric Power Division.
   2. Cummins Power Generation.
   3. Kohler Power

B. Source Limitations: Obtain packaged generator sets and auxiliary components through

one source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Engine-generator set housing, subbase fuel tank, day tank, engine-generator set, batteries, battery racks, silencers, and sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst case normal levels.
   3. Component Importance Factor: 1.5.

B. ASME Compliance: Comply with ASME B15.1.

C. NFPA Compliance:
   1. Comply with NFPA 37.
   2. Comply with NFPA 70.
   3. Comply with NFPA 99.
   4. Comply with NFPA 110 requirements for Level 2 emergency power supply system.

D. UL Compliance: Comply with UL 2200.

E. Engine Exhaust Emissions: Comply with EPA Tier 3 requirements and applicable state and local government requirements.

F. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

G. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
   1. Ambient Temperature: Minus 15 to plus 40 deg C.
   2. Relative Humidity: Zero to 95 percent.
   3. Altitude: Sea level to 6500 feet.

2.3 ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

C. EPSS Class: Engine-generator set shall be classified as a Class 48 in

accordance with NFPA 110.

D. Induction Method: Naturally aspirated.

E. Governor: Adjustable isochronous, with speed sensing.

F. Emissions: Comply with EPA Tier 3 requirements.

G. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
   1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.
   2. Contractor shall provide a concrete pad 8” thick with 4” above finish grade with #4-12” on center each way within top 3” of concrete. Concrete shall be 3,000 psi at 28 days. Concrete pads shall be 6” larger each way of generator.

H. Capacities and Characteristics:
   1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries, with capacity as required to operate as a unit as evidenced by records of prototype testing.
   2. Output Connections: Three-phase, four wire.
   3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

I. Generator-Set Performance:
   1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
   2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step- load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
   3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
   4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
   5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step- load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
   6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
   7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
   8. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 ENGINE

A. Fuel: Fuel oil, Grade DF-2.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.

D. Lubrication System: The following items are mounted on engine or skid:
   1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
   2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
   3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

F. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
   1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
   2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
   3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
   4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
   5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
      a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
      b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

G. Muffler/Silencer: Commercial type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
   1. Minimum sound attenuation of 75 dBa.
   2. Sound level measured at a distance of 23 feet from exhaust discharge after installation is complete shall be 75 dBA or less.

H. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

I. Starting System: 24-V electric, with negative ground.
   1. Components: Sized so they are not damaged during a full engine-cranking cycle

with ambient temperature at maximum specified in "Performance Requirements" Article.

2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.
9. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:
    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 DIESEL FUEL-OIL SYSTEM

A. Comply with NFPA 30.

B. Piping: Fuel-oil piping shall be Schedule 40 black steel, complying with requirements

UL-143 & PEI Standards. Cast iron, aluminum, copper, and galvanizing shall not be used in the fuel-oil system.

C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

D. Fuel Filtering: Remove water and contaminants larger than 1 micron.

E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:
   1. Tank level indicator.
   2. Fuel-Tank Capacity: Minimum 133 percent of total fuel required for periodic maintenance operations between fuel
   3. Leak detection in interstitial space.
   4. Vandal-resistant fill cap.
   5. Containment Provisions: Comply with requirements of authorities having jurisdiction.
   6. Tank Capacity: As recommended by engine manufacturer for an uninterrupted period of 8 hours' operation at 100 percent of rated power output of engine-generator system without being refilled.

2.6 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.

B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms.

C. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.

D. Comply with UL 508A.

E. Configuration: Operating and safety indications, protective devices, basic system controls, engine gages, instrument transformers, generator disconnect switch or circuit breaker, and other indicated components shall be grouped in a combination control and power panel. Control and monitoring section of panel shall be isolated from power sections by steel barriers. Panel shall be powered from the engine-generator set battery. Panel features shall include the following:
   1. Wall-Mounting Cabinet Construction: Rigid, self-supporting steel unit complying

with NEMA ICS 6. Power bus shall be copper. Bus, bus supports, control wiring, and temperature rise shall comply with UL 891.

2. Switchboard Construction: Freestanding unit complying with Section 262413 "Switchboards."

F. Indicating Devices : As required by NFPA 110 for Level 2 system, including the following:
   1. AC voltmeter.
   2. AC ammeter.
   3. AC frequency meter.
   4. EPS supplying load indicator.
   5. Ammeter and voltmeter phase-selector switches.
   6. DC voltmeter (alternator battery charging).
   7. Engine-coolant temperature gage.
   8. Engine lubricating-oil pressure gage.
   9. Running-time meter.
   10. Current and Potential Transformers: Instrument accuracy class.

G. Protective Devices and Controls in Local Control Panel: Shutdown devices and common visual alarm indication as required by NFPA 110 for Level 2 system, including the following:
   1. Start-stop switch.
   2. Overcrank shutdown device.
   3. Overspeed shutdown device.
   4. Coolant high-temperature shutdown device.
   5. Coolant low-level shutdown device.
   6. Low lube oil pressure shutdown device.
   7. Air shutdown damper shutdown device when used.
   8. Overcrank alarm.
   9. Overspeed alarm.
   10. Coolant high-temperature alarm.
   11. Coolant low-temperature alarm.
   12. Coolant low-level alarm.
   13. Low lube oil pressure alarm.
   14. Air shutdown damper alarm when used.
   15. Lamp test.
   16. Contacts for local and remote common alarm.
   17. Coolant high-temperature prealarm.
   18. Generator-voltage adjusting rheostat.
   19. Main fuel tank low-level alarm.
      a. Low fuel level alarm shall be initiated when the level falls below that required for operation for the duration required in "Fuel Tank Capacity" Paragraph in "Diesel Fuel-Oil System" Article.
   20. Run-Off-Auto switch.
   21. Control switch not in automatic position alarm.
   22. Low-starting air pressure alarm.
   23. Low-starting hydraulic pressure alarm.
   24. Low cranking voltage alarm.
   25. Battery-charger malfunction alarm.
   26. Battery low-voltage alarm.
   27. Battery high-voltage alarm.

28. Generator overcurrent protective device not closed alarm.

H. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

I. Connection to Datalink: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication. Provide connections for datalink transmission of indications to remote data terminals via ModBus. Data system connections to terminals are covered in Section 260913 “Electrical Power Monitoring and Control.”

J. Common Remote Panel with Common Audible Alarm: Comply with NFPA 110 requirements for Level 2 systems. Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine-generator set battery.

K. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush- mounting type to suit mounting conditions indicated.
1. Overcrank alarm.
2. Coolant low-temperature alarm.
3. High engine temperature prealarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Lamp test.
18. Low cranking voltage alarm.
19. Generator overcurrent protective device not closed.

L. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

M. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
   1. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Circuit Breaker: Insulated-case, electronic-trip type; 100 percent rated; complying with UL 489.
   1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   2. Trip Settings: Selected to coordinate with generator thermal damage curve.
   3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
   4. Mounting: Adjacent to or integrated with control and monitoring panel.

C. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:
   1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
   2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
   3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
   4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

D. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.
   1. Indicate ground fault with other generator-set alarm indications.
   2. Trip generator protective device on ground fault.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six lead alternator.

E. Range: Provide broad range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

G. Enclosure: Dripproof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.
   1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
   2. Maintain voltage within 15 percent on one step, full load.
   3. Provide anti-hunt provision to stabilize voltage.
   4. Maintain frequency within 5 percent and stabilize at rated frequency within 2 seconds.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Subtransient Reactance: 12 percent, maximum.

2.9 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

B. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
   1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
   2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.
   3. Ventilation: Provide temperature-controlled exhaust fan interlocked to prevent operation when engine is running.

C. Interior Lights with Switch: Factory-wired, vapor-proof fixtures within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.
   1. AC lighting system and connection point for operation when remote source is available.
   2. DC lighting system for operation when remote source and generator are both unavailable.

D. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

2.10 MOTORS

A. Description: NEMA MG 1, Design B, medium induction random-wound, squirrel cage motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

E. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

F. Temperature Rise: Match insulation rating.

G. Code Letter Designation:
   1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
   2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

H. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

I. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in electrical Sections.

2.11 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
   1. Material: Bridge-bearing neoprene, complying with AASHTO M 251 separated by steel shims.
   2. Shore "A" Scale Durometer Rating: 60 - 70.
   3. Number of Layers: Two - Four.
   4. Minimum Deflection: 1 inch.

B. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
   1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
   2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
   3. Minimum Additional Travel: 50 percent of required deflection at rated load.
   4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Minimum Deflection: 1 inch.

C. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.12 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.13 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
   1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
   1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
   2. Test generator, exciter, and voltage regulator as a unit.
   3. Full load run.
   4. Maximum power.
   5. Voltage regulation.
   6. Transient and steady-state governing.
   7. Single-step load pickup.
   8. Safety shutdown.
   9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
   10. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements

indicated:

1. Notify Owner no fewer than two working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

3.3 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Install packaged engine-generator to provide access, without removing connections or accessories, for periodic maintenance.

D. Install packaged engine-generator with elastomeric isolator pads or restrained spring isolators having a minimum deflection of 1 inch on 4-inch- high concrete base. Secure sets to anchor bolts installed in concrete bases.

E. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe with welded joints.

F. Installation requirements for piping materials and flexible connectors are specified in Section 232116 "Hydronic Piping Specialties." Copper and galvanized steel shall not be used in the fuel-oil piping system.

G. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine-generator to allow service and maintenance.

C. Connect engine exhaust pipe to engine with flexible connector.

D. Connect fuel piping to engines with a gate valve and union and flexible connector.

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90 degree bend in flexible conduit routed to the generator set from a stationary element.

G. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components according to Section 260553 "Identification for Electrical Systems."

B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Tests and Inspections:
1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs as specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
    a. Visual and Mechanical Inspection
        1) Compare equipment nameplate data with drawings and specifications.
        2) Inspect physical and mechanical condition.
        3) Inspect anchorage, alignment, and grounding.
        4) Verify the unit is clean.
    b. Electrical and Mechanical Tests
        1) Perform insulation-resistance tests in accordance with IEEE 43.
            a) Machines larger than 200 horsepower. Test duration shall be 10 minutes. Calculate polarization index.
            b) Machines 200 horsepower or less. Test duration shall be one minute. Calculate the dielectric-absorption ratio.
        2) Test protective relay devices.
        3) Verify phase rotation, phasing, and synchronized operation as required by the application.
        4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
        5) Conduct performance test in accordance with NFPA 110.
        6) Verify correct functioning of the governor and regulator.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.

3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
   a. Measure charging voltage and voltages between available battery terminals for full- charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
   b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
   c. Verify acceptance of charge for each element of the battery after discharge.
   d. Verify that measurements are within manufacturer's specifications.
4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float- charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
7. Exhaust Emissions Test: Comply with applicable government test criteria.
8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases and verify that performance is as specified.
9. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.

D. Coordinate tests with tests for transfer switches and run them concurrently.

E. Test instruments shall have been calibrated within the last 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

F. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

G. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

I. Remove and replace malfunctioning units and retest and reinspect as specified above.

J. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a

label or tag to each tested component indicating satisfactory completion of tests.

L. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.
   1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
   2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

SECTION 263600

TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes automatic transfer switches rated 600 V and less, including the following:
   1. Remote annunciator and control system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transfer switches.
   2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

B. Shop Drawings:
   1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
   2. Include material lists for each switch specified.
   3. Single-Line Diagram: Show connections between transfer switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.
   4. Riser Diagram: Show interconnection wiring between transfer switches, bypass/isolation switches, annunciators, and control panels.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For transfer switches, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      a. Features and operating sequences, both automatic and manual.
      b. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Member company of NETA.
      a. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA ICS 1.

C. Comply with NFPA 99.

D. Comply with NFPA 110.

E. Comply with UL 1008 unless requirements of these Specifications are stricter.

F. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

G. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
   1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
   2. Short-time withstand capability for 30 cycles.

H. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

I. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

J. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

K. Service-Rated Transfer Switch:
1. Comply with UL 869A and UL 489.
2. Provide terminals for bonding the grounding electrode conductor to the grounded service conductor.
3. In systems with a neutral, the bonding connection shall be on the neutral bus.
4. Provide removable link for temporary separation of the service and load grounded conductors.
5. Surge Protective Device: Service rated.
6. Ground-Fault Protection: Comply with UL 1008 for normal and alternative buses.
7. Service Disconnecting Means: Externally operated, manual electrically actuated.

L. Neutral Terminal: Solid and fully rated unless otherwise indicated.

M. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

N. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

O. Battery Charger: For generator starting batteries.
1. Float type, rated 10 A.
2. Ammeter to display charging current.
3. Fused ac inputs and dc outputs.

P. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

Q. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed shrinkable sleeve markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."
1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

4. Accessible via front access.

R. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Cummins Power Generation.
2. Generac Power Systems, Inc.
3. General Electric Company.
4. Hubbell Power Systems, Inc.
5. Kohler Power Systems.
6. ASCO Power Technologies/Schneider Electric

B. Comply with Level 1 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Hard-drawn copper, 98 percent conductivity.
6. Main and Neutral Lugs: Mechanical type.
7. Ground Lugs and Bus-Configured Terminators: Mechanical type.
8. Ground bar.
9. Connectors shall be marked for conductor size and type according to UL 1008.

D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.
1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

E. Electric Switch Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.

F. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.

G. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

H. Automatic Transfer-Switch Controller Features:
1. Controller operates through a period of loss of control power.

2. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is unavailable.

2.3 TRANSFER SWITCH ACESSORIES

A. Remote Annunciator and Control System:
1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Include the following functions for indicated transfer switches:
    a. Indication of sources available, as defined by actual pickup and dropout

settings of transfer-switch controls.
b. Indication of switch position.
c. Indication of switch in test mode.
d. Indication of failure of digital communication link.
e. Key-switch or user-code access to control functions of panel.
f. Control of switch-test initiation.
g. Control of switch operation in either direction.
h. Control of time-delay bypass for transfer to normal source.

3. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically shall revert to standalone, self-contained operation. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation.
4. Remote Annunciation and Control Panel: Solid-state components. Include the following features:
   a. Controls and indicating lights grouped together for each transfer switch.
   b. Label each indicating light control group. Indicate transfer switch it controls, location of switch, and load it serves.
   c. Digital Communication Capability: Matched to that of transfer switches supervised.
   d. Mounting: Flush, modular, steel cabinet unless otherwise indicated.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

B. Prepare test and inspection reports.
1. For each of the tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for the following conditions:
   a. Overvoltage.
   b. Undervoltage.
   c. Loss of supply voltage.
   d. Reduction of supply voltage.
   e. Alternative supply voltage or frequency is at minimum acceptable values.
   f. Temperature rise.
   g. Dielectric voltage-withstand; before and after short-circuit test.
   h. Overload.
   i. Contact opening.
   j. Endurance.
   k. Short circuit.
   l. Short-time current capability.
   m. Receptacle withstand capability.
   n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.
   1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete" or Section 033053 "Miscellaneous Cast-in-Place Concrete."
   2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
   3. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
   4. Provide workspace and clearances required by NFPA 70.

B. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

C. Identify components according to Section 260553 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.
   1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 271500 "Communications Horizontal Cabling.

F. Final connections to equipment shall be made with liquid tight, flexible metallic conduit no more than 18 inches in length.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:
   1. After installing equipment, test for compliance with requirements according to

NETA ATS.

2. Visual and Mechanical Inspection:
   a. Compare equipment nameplate data with Drawings and Specifications.
   b. Inspect physical and mechanical condition.
   c. Inspect anchorage, alignment, grounding, and required clearances.
   d. Verify that the unit is clean.
   e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
   f. Verify that manual transfer warnings are attached and visible.
   g. Verify tightness of all control connections.
   h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:
      1) Use of low-resistance ohmmeter.
      2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
   i. Perform manual transfer operation.
   j. Verify positive mechanical interlocking between normal and alternate sources.
   k. Perform visual and mechanical inspection of surge arresters.
   l. Inspect control power transformers.
      1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
      2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
      3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.
3. Electrical Tests:
   a. Perform insulation-resistance tests on all control wiring with respect to ground.
   b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
   c. Verify settings and operation of control devices.
   d. Calibrate and set all relays and timers.
   e. Verify phase rotation, phasing, and synchronized operation.
   f. Perform automatic transfer tests.
   g. Verify correct operation and timing of the following functions:
      1) Normal source voltage-sensing and frequency-sensing relays.
      2) Engine start sequence.
      3) Time delay on transfer.
      4) Alternative source voltage-sensing and frequency-sensing relays.
      5) Automatic transfer operation.
      6) Interlocks and limit switch function.
      7) Time delay and retransfer on normal power restoration.
      8) Engine cool-down and shutdown feature.
4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation- resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
   a. Check for electrical continuity of circuits and for short circuits.

b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

5. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.
   a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
   b. Simulate loss of phase-to-ground voltage for each phase of normal source.
   c. Verify time-delay settings.
   d. Verify pickup and dropout voltages by data readout or inspection of control settings.
   e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
   f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
   g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool- down and shutdown.
6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.
   a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Transfer switches will be considered defective if they do not pass tests and inspections.

F. Remove and replace malfunctioning units and retest as specified above.

G. Prepare test and inspection reports.

H. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.
1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.

C. Coordinate this training with that for generator equipment.

END OF SECTION

SECTION 26 4300

SURGE SUPPRESSION PROTECTION DEVICES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The specified unit shall provide effective high energy transient voltage suppression, surge current diversion, high frequency attention and line control for all electrical modes of equipment connected downstream from the facility's meter or main overcurrent device in the afore mentioned ANSI/IEEE C62. 41-1991 environment(s). The unit shall be connected in parallel with the facility's wiring system.

B. The unit shall be designed and manufactured in the USA by a qualified manufacturer of suppression filter system equipment. The qualified manufacturer shall have been engaged in the commercial design and manufacturer of such products for minimum of ten (10) years.

1.2 ENVIRONMENTAL REQUIREMENTS

A. Storage Temperature. Storage temperature range shall be -40 to + 85 C" (-40 to +185F).

B. Operating Temperature. Operating temperature range shall be -40 to +140F).

C. Relative Humidity. Operation shall be reliable in an environment with 5% to 95% non-condensing relative humidity.

D. Operating Altitude. The unit shall be capable of operation in altitudes up to 13,000 feet above sea level.

E. Audible Noise. The unit shall not generate any audible noise.

F. Magnetic Field. No appreciable magnetic fields shall be generated. Unit shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.

1.3 RELATED DOCUMENTS AND APPLICABLE STANDARDS

A. Systems shall be designed, manufactured, tested and installed in accordance with the following standards:
1. Underwriters Laboratories (UL 1449, 2nd addition)
2. Canadian Standard Association (CSA)
3. National Electrical Manufacturers Association (LS-1-1992, 2.2.9 and 3.9)
4. American National Standards Institute
5. Institute of Electrical an Electronic Engineers (C62.41 and C62.45)
6. Military Standards (SIL-STD 220A)
7. National Electric Code (Article 280)
8. National Fire Protection Association (NFPA-78)
9. Federal Information Processing Standards Publication (FIPS PUB 94)
10. Underwriter's Laboratory 248-1 individual MOV fusing requirements.

11. Items 1 and 2 shown above shall also include industry recognized independent test data, showing the equipment has passed these tests. A copy of these results shall be included with the approval package.

1.4 TRANSIENT VOLTAGE SURGE SUPPRESSION

A. System shall be tested to meet ANSI/IEEE C62.41-1991, tested per ANSI/IEEE C62.45-1992.

B. The system shall be tested to 1,000 sequential ANSI/IEEE C62.41 Category C waveforms.

C. The system shall be tested to UL1283 for electrical line noise attenuation. A minimum of 8 points shall be shown for specific db attenuation over frequency range of 50KHz - 100MHz.

1.5 WORK INCLUDED

A. Transient Voltage Surge Suppression (TVSS) System

1.6 SUBMITTALS FOR REVIEW

A. Section 260500 – Submittals

B. Product Data: Provide shop drawings for all devices utilized.

PART 2 – PRODUCTS

2.1 UNIT OPERATING VOLTAGE

A. The nominal unit operating voltage and configuration shall be as indicated on the drawings.

2.2 MAXIMUM CONTINUOUS OPERATING VOLTAGE (MCOV)

A. The maximum continuous operating voltage (MCOV) of all suppression components utilized in the unit shall not be less than 115% of the facility’s nominal operating voltage.

2.3 SERVICE ENTRANCE PANELS

A. Unit shall be rated Category C3 location per ANSI/IEEE C62.41-1991.

B. The tested single-pulse surge current capacity, in amps, of the unit, based on ANSI/IEEE c62.41-1991’s standard 8X20 microsecond current waveform, and in accordance with NEMA Publication No. LS 1-1992, shall be no less than as follows:

C. Mode of ProtectionL-LL-NL-GN-GTested Single Pulse Surge Current150,000150,000150,000150,000

D. Unit shall have individually fused MOV's, with the fusing designed to operate only in the event of a fault within the TVSS. In the event of a fuse operating, the remaining fuses shall stay on line to protect the system.

E. The unit's published performance ratings shall be the UL 1449 Listed suppression ratings. The UL 1449 suppression rating shall be, for each mode of protection, as follows:

F. Nominal System VoltageL-NL-GN-G120/208400/450400/500450/425277/480850/850825/850875/825347/6001000/120010 00/12001000
   1. Note: Numbers following slash indicate UL 1449 suppression rating for models with integral disconnect switch.
   2. The unit shall include a high-frequency extended range tracking filter and shall be UL 1283 Listed as an Electromagnetic Interference Filter.
   3. The unit shall include mechanical lugs for each phase, neutral and ground, if applicable. The lugs shall accommodate up to #2 AWG copper conductor with integral disconnect switch and up to 1/0 AWG copper conductor without integral disconnect switch.
   4. Units shall be provided in a NEMA 1 type enclosure of 14 gauge steel. Dimensions shall not be greater than 22" wide by 38" high by 12" deep. Weight shall not exceed 100 lbs. (max).

G. Accessories
   1. Integral Disconnect Switch
      a) The unit shall include an integral safety interlocked disconnect switch located in the unit enclosure with an externally mounted manual operator. The switch shall be rated for 600 Vac. Specify "DM" suffix.
   2. ON-LINE METERING
      a) The unit shall include an integral multifunction power monitor analyzer. The multimeter shall provide real-time product performance via multiport visual status indicators (LED's) and a touchpad accessible LED data display. The Following features shall include:
         1) Enhanced Status Indicators. At the touch of a button, the indicators shall show the following data:
            (a) %protection available from the TVSS system.
            (b) Neutral to Ground fault indication.
            (c) Neutral to Ground current sensing.
            (d) True RMS voltage of system connected.
            (e) Voltage sag detection. (Any voltage sag<90% of nominal)
            (f) Voltage swell detection. (Any voltage swell >110% on nominal)
            (g) Power dropout detection. (Any voltage dropout of <1 cycle)
            (h) Power outage detection. (Any voltage outage of >1 cycle)
         2) Dual form C contacts (normally open and normally closed design).
         3) Display event counter.

4) Battery powered audible alarm. (Can be defeated on the front panel)

2.4 DISTRIBUTION PANELS/PANELBOARDS/VFD'S

A. Unit shall be rated Category B3 location per ANSI/IEEE C62.41-1991.

B. The tested single-pulse surge current capacity, in amps, of the unit, based on ANSI/IEEE C62.41-1991's standard 8X20 microsecond current waveform, and in accordance with NEMA Publication No. LS 1-1992, shall be no less than as follows:

C. Mode of ProtectionL-LL-NL-GN-GPer PhaseTested single Pulse Surge Current100,000100,000100,000100,000200,000

D. Unit shall have indicator status lights for the TVSS device, verifying proper operation.

E. The unit's published performance ratings shall be the UL 1449, 2nd edition, Listed suppression ratings. The UL 1449 suppression rating shall be, for each mode of protection, as follows:
   1. Nominal System Voltage L-NL-GN-G120/208400/450400/500450/425277/480850/850825/850875/825347/6001000/12001000/12001000
      a) Note: Numbers following slash indicate UL 1449 suppression rating for models with integral disconnect switch.

F. The unit shall include a high-frequency extended range-tracking filter and shall be UL 1283 Listed as an Electromagnetic Interference Filter.

G. The unit shall include mechanical lugs for each phase, neutral and ground, if applicable. The lugs shall accommodate up to #8 AWG copper conductor with integral disconnect switch and up to 1/0 AWG copper conductor without integral disconnect switch.

H. Units shall be provided in a NEMA 1 type enclosure of 14-gauge steel. Dimensions shall both be greater than 13" wide by 24" high by 8" deep. Weight shall not exceed 40 lbs. (max).

I. Accessories
   1. Integral Disconnect Switch
      a) The unit shall include an integral safety interlocked disconnect switch located in the unit enclosure with an externally mounted manual operator. The switch shall be rated for 600 Vac. Specify "DM" suffix.

PART 3 –<u>EXECUTION</u>

3.2 INSTALLATION

A. The specified system shall be installed no further than ten (10) feet in total wire lead length distance from the service entrance bus, distribution panelboard bus or variable frequency drive it is protecting and shall avoid any unnecessary bends. Insulated conductors shall be provided for all necessary power and ground connections.

B. System shall be complete, including status indicator lights providing independent protection circuit status.

C. Other materials and equipment shall comply with applicable Sections of this Division.

3.3 WARRANTY

A. Manufacturer shall provide a product warranty for (5) five years from date of installation. Warranty shall cover unlimited replacement of system components during the warranty period.

3.4 QUALITY ASSURANCE

A. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design and manufacturing for at least 10 years.

B. Start-Up Testing**.** Upon completion of installation, a factory-certified local service technician shall provide testing services. The following tests shall be performed: (a) voltage measurements from Line-to-Ground, Line-to-Neutral, Line-to-Line and Neutral-to-Ground (no neutral in DELTA configurations) at the time of the testing procedure, (b) impulse injection to verify the system suppression voltage tolerances for all suppression paths. A copy of the start-up test results and the factory benchmark testing results shall be supplied to the engineer and the owner for confirmation of proper suppression filter system function. In addition, the integrity of the neutral-ground bond should be verified through testing and visual inspection. A Seven-Year Limited Warranty shall initiate after the owner has accepted the testing results and taken possession of the equipment.

END OF SECTION

SECTION 26 5119

LED INTERIOR LIGHTING

PART 1 – GENERAL

1.1 Conform with applicable provisions of the General Conditions, Supplementary Conditions and General Requirements.

1.2 RELATED WORK IN OTHER SECIONS

260500 – GENERAL ELECTRICAL PROVISIONS
260519 – LOW VOLTAGE CONDUCTORS
260526 - GROUNDING
260533 – RACEWAYS, BOXES AND FITTINGS
262726 – WIRING DEVICES AND PLATES

1.3 SECTION INCLUDES:

A. Interior solid-state luminaires that use LED technology.

B. Lighting fixture supports.

C. Construction and installation requirements.

1.4 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See “Luminaire”.

D. IP: International Protection of Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.5 SUBMITTALS

A. Product Data: For each type of product, arranged by designation.

B. Product Schedule: For luminaires and lamps. Use same designation indicated on Drawings.

C. Refer to Section 260500 for additional requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved.

B. Product Certificates: For each type of luminaire.

C. Sample warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.8 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Recessed Fixtures: Comply with NEMA LE 4.

C. CRI and CCT shall be as scheduled on contract documents.

D. Rated lamp life of 50,000 hours.

E. Lamps dimmable from 100 percent to 0 percent of maximum light output.

F. Internal driver.

G. Nominal Operating Voltage: as specified on the drawings.

H. Housings:
1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

2.2 MATERIALS

A. Metal Parts:
1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:
1. Prismatic acrylic.
2. Acrylic: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Lens thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:
1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.

2.3 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 “Hangers and Supports for Electrical Systems” for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: ½-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports: Sized and rated for luminaire weight.

E. Flush-Mounted Luminaire Support: Secured to outlet box.

F. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch-diameter aircraft cable supports adjustable to 120 inches in length. Brace to limit sway or swinging.

G. Suspended Luminaire Support:
1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging or sway.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:
1. Secure to any required outlet box.
2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

L. Comply with requirements in Division 26 for Power Conductors and Cables for wiring connections.

J. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 for Identification for Electrical Systems.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare Test and inspection reports.

END OF SECTION

SECTION 27 0000

COMMUNICATIONS INDEX

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

A. All bids shall be based on the equipment as specified herein. The specifying authority must approve any alternate system.

B. Bidders wishing to submit alternate equipment shall submit to the specifying authority, at least 10 days prior to bid opening, the equipment proposed to provide a precise functional equivalent system to meet specifications. Bidder shall provide adequate information prior to bid date such as specification sheets, working drawings, shop drawings, and a demonstration of the system. Alternate supplier-contractor must also provide a list to include six installations of the identical system proposed which have been in operation for a period of two years.

C. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system at the contractor's expense.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Requirements of the following Division 26 Sections apply to this Section:
   1. Basic Electrical Requirements.
   2. Basic Electrical Materials and Methods.

1.3 COMMUNICATIONS DIVISION INDEX

END OF SECTION

SECTION 27 05 28

PATHWAYS FOR COMMUNICATION SYSTEMS

PART 1: GENERAL

The Contractor is responsible to be knowledgeable with provisions contained herein and with other Sections of this Specification as applicable to the work pertaining to this section.

1.1 SCOPE OF WORK

A. The scope of work under this section consist of providing conduits, boxes, raceways, and pathways and cable supports for all telecommunications including but not limited to security, access controls, etc. wiring including in this project.

B. Work covered by this Section shall consist of furnishing labor, equipment, supplies, material, unless otherwise specified, and performing the following operations are necessary for the installation and testing of all infrastructure required by this specification's standard.

C. The horizontal infrastructure begins in the telecommunications room (TR) and is terminated at the telecommunications outlet that is located in the end user work area.

D. Only the UNMH IT approved manufacturers for structured cabling systems shall be installed in the pathways. The exact Category performance requirements are project specific. Verify and comply with manufacturer installation and warranty requirements when designing and installing structured cabling systems.

E. The typical Telecommunications Outlet is a Category 6 faceplate shall be provisioned to accept four (4) ports. The standard installation is (2) Category 6 cables and (2) 8P8C jacks. There will be applications where other cabling requirements are needed. When these cables are added to the TO such as (Category 6, 6A, F/UTP Fiber or Coax) use approved jacks. Sizing of the pathway will need to be adjusted to meet additional cabling requirements. Initial installation to only have a 40% fill rate.

F. Provide conduits and boxes for Code Blue Emergency Phones, Elevator Phones, mechanical and electrical metering equipment and wall phones.

G. Furnish and install an inter-building cabling infrastructure and pathways. Originate the system from the building's main equipment room and distribute to telecommunications room.

H. Furnish and install raceways and cable tray systems in hallways and other accessible areas, above ceilings where applicable or as specified in the project documents and drawings.

I. Transition cable tray to conduit systems in inaccessible areas. Must meet the same volume as tray.

J. Install cable tray and raceway systems according to the manufactures' product installation instructions using the manufactures' approved methods and components.

K. Furnish, install and document re-enterable UL listed firestop assemblies at all firewall penetrations. UNMH IT approved firestop systems are Hilti Document means manufactures label permanently attached to the wall located adjacent to the penetration along with a photo taken and submitted to (UNMH IT).

1.2 RELATED SECTIONS

A. Division 26, Electrical Division

B. Division 27, Communicants Systems.

C. Division 28, Electronic Safety and Security

1.3 RELATED REFERENCES

A. All work performed under this section must comply with the manufactures' approved methods and comply with most recent versions the following Industry Standards and Practices applicable to work being performed under this section. The contractor shall have working knowledge and possess the following documents of the Standards and Methods listed, and must adhere to the most recent published edition.

1. National Fire Protection Association
2. National Electrical Code
3. National Electrical Safety Code
4. Telecommunications Industry Association (including but not limited to)
   a. TIA/EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces.
   b. TIA/EIA 758 Customer Owned Outside Plant Telecommunications Cabling Standard.
   c. TIA/EIA 568 Commercial Building Telecommunications Cabling Standard
   d. TIA/EIA 607 Grounding
5. Building Industry Consulting International (BICSI)
   a. Telecommunications Distribution Design Manual

PART 2: PRODUCTS

2.1 TELECOMMUNICATIONS OUTLETS BOXES, FLOOR BOXES and SURFACE RACEWAYS

A. Telecommunication Outlets shall have the ability to accommodate a complete line of connectivity modules including those for UTP cables Category 6, Category 6 Augmented F/UTP, fiber optic, coaxial, and other cabling types with matching faceplates and bezels to facilitate mounting.

1. It is the responsibility of the RCDD, Electrical Engineer and Contractor to verify that the design requirements which are specified below have been met.
2. It is the responsibility of the contractor to submit an RFI for any noted incorrect designs or conditions found that do not meet the requirements of this

Specification Standard.

B. Furnish and install for construction telecommunications outlets in studded drywall or masonry wall providing a 4 11/16" inch square 2 1/8" inch deep boxes with 1" inch mud ring provisioned with a 1" inch conduit knockouts. The box depth will be 3 1/8" inch. It is the responsibility of the designer, electrical contractor and structured cabling contractor are to identify and verify the conduit and box size to match cabling requirements at each location.

1. Fiber Optic, Category 6, and Category 6 Augmented F/UTP radius: The depth of the box shall accommodate a 1 ¼" inch cable bend radius, which meets or exceeds the specifications for fiber optic and UTP cabling per TIA/EIA-569 requirements for communications pathway. A 1 ¼" inch controlled radius storage loop shall be installed.

C. The minimum requirement for all telecommunications outlets is a 1" inch conduit(s) provisioned with a bushing on each and a measured pulled line secured at each termination point for horizontal cabling installation. The conduit sizing and fill ratio shall be verified in design and provided to meet the requirements of the TIA/EIA 568,569 with an initial installation fill ratio of 40% percent.

D. For all horizontal cabling pathways provide a minimum of a 1" inch conduit from the outlet box to the nearest cable tray or conduit system. Terminate conduits above cable trays at approximately 12 inches to the nearest side rail.

E. In inaccessible as well as areas that are non-adjacent to spaces conduit shall be provided from the outlet box to the nearest cable tray or conduit system with no exceptions. Terminate conduits above cable trays at approximately 12" inches to the nearest side rail.

2.2 FLOOR BOXES

A. Floor boxes provide the interface between power, communication and AV cabling in an on- grade or above-grade concrete floor where power and communications services are required. Boxes shall provide flush or recessed device outlets that will not obstruct the floor area.

B. Floor box and covers must be heavy duty in construction, watertight and easily accessible by users. Meeting and Exceeding Water Exclusion Standards in Poke-Thru Devices and Floor Boxes UL514A standards require that all concrete floor box covers and poke-thru devices meet a carpet water exclusion test. Water exclusion tests are designed to simulate typical maintenance procedures such as mopping tile floors and shampooing carpets.

C. All floor boxes shall be submitted and approved by UNMH IT.

1. An acceptable pre-approved box is Wiremold RFB6.

D. Communications Devices and Accessories: Floor box shall accommodate a complete line of connectivity outlets and snap-in modular inserts for UTP including Category 6, 6 Augmented F/UTP, fiber optic, coaxial and other cabling types with matching faceplates and bezels to facilitate mounting. Where indicated, provide connectivity outlets and modular inserts. **Bezels shall be supplied by the contractor furnishing**

the floor boxes.

E. Furnish and install 1 ¼" EMT conduit to each floor box. **DO NOT DAISY CHAINFLOOR BOXES.**

F. Covers and Bezels: Floor box options shall accept both brass and nonmetallic cover plates and flanges. Flanges for both brass and nonmetallic shall be available in one, two, and three gang applications and installed on boxes. Each flange shall provide ½" inch of adjustment to accommodate various floor covering and concrete depths.

2.3 POKE THRU DEVICES

A. Poke-thru devices provide a path for power and communications cabling in an above grade concrete or steel deck floor and the workstation are activation location where power and data communication devices outlets are required.

B. Poke Thru Devices and covers must be heavy duty in construction, watertight and easily accessible by users. Meeting and Exceeding Water Exclusion Standards in Poke-Thru Devices and Floor Boxes UL514A standards require that all concrete floor box covers and poke-thru devices meet a carpet water exclusion test. Water exclusion tests are designed to simulate typical maintenance procedures such as mopping tile floors and shampooing carpets.

C. All Poke-thru devices shall be submitted and approved by UNMH IT.

D. Poke-thru devices shall be suitable for use in air handling space in accordance with Section 300-22 of the National Electrical Code.

E. Furnish with necessary channels to provide complete separation of power and communication service. There shall be one minimum 1 ¼" inch channels for communication cabling to the nearest cable pathway. The channels shall be arranged such that communication cables can be conduit protected and connected to the insert body.

F. Activation slides covers shall provide spring-loaded slides that snap back in place when not in use to protect the flush mounted power receptacle.

G. Communications Devices and Accessories: Poke Thru Devices shall accommodate a complete line of connectivity outlets and snap-in modular inserts for UTP including Category 6, 6 Augmented F/UTP, fiber optic, coaxial and other cabling types with matching faceplates and bezels to facilitate mounting. Where indicated, provide connectivity outlets and modular inserts. **Bezels shall be supplied by the contractor furnishing the Poke Thru.**

H. The poke thru shall have an incorporated approved UL firestop system that meets the rating of the floor.

I. Unit shall be installed per Manufacture Specifications.

2.4 SURFACE MOUNTING RACEWAYS (SMR)

A. A submittal is required on all SMR, outlet and its accessories to UNMH IT for

approval prior to construction.

B. Furnished and install surface raceways with connecting EMT conduit system to nearest Horizontal Distribution Infrastructure connection point. Size conduits to meetthe cabling requirements of surface mounted raceway system with 60% growth.

C. Provide surface raceway systems for branch circuits and data networks voice and other low-voltage wiring. Surface raceway system shall consist of raceway covers;appropriate fittings and device mounting plates necessary for complete installation.

D. Provide full capacity corners elbows and tees fittings to maintain the proper bendradius, meeting the specification for Fiber Optic and UTP cabling exceeding the TIA/EIA-569 requirements for communications pathways.

E. Raceway Covers and Devices Plates: Raceway covers with cable exiting the SMR shall have a hole-cut with grommet. Wiring connections of these devices shall be completed during installation.

F. Ensure depth of surface raceway will provide sufficient space for jacks, bends radius for terminations.

G. Provide full capacity corner elbows and tee fittings to maintain a proper bend radius, meeting the specifications for Fiber Optic and UTP and cabling and exceeding TIA/EIA-569 requirements for communications pathways.

J. Surface mounted Raceway shall accommodate a complete line of connectivity outlets and snap-in modular inserts for UTP including Category 6, 6 Augmented F/UTP, fiber optic, coaxial and other cabling types with matching faceplates and bezels to facilitate mounting. Where indicated, provide connectivity outlets and modular inserts. **Bezels shall be supplied by the contractor furnishing the SMR.**

2.5 SERVICES POLES

A. All service poles shall be submitted to and approved by UNMH IT.

B. Provide indoor service poles systems to the, video, and other universal communications cabling to points of use shown on the Drawings. System shall consist of multi-outlet assemblies, and appropriate fittings and accessories as required for complete assembly.

C. Provide removable cover section at compartment bottom to assemble and mount communications connections. Sections shall be removable without dismantling or removing the pole after installation. The cover section shall have six knockouts for modular universal jacks and a rectangular knockout for modular furniture outlet. Include a knockout with grommet for straight through communications cabling access.

D. Provide entrance fittings for the top of the communications channel, ceiling trim plate, pole- mounting bracket, carpet gripper pad, and adhesive pad. For air handling spaces, furnish an entrance end fitting.

E. Pole shall be UL listed for field modifications, changes and additions of receptacles, devices and circuits. Field installed power devices covers shall be available to add duplex, single 1.40" inch and 1.59" inch and rectangular type receptacles. Covers shall match and finish of pole. Add-on communications covers shall be available to mount workstations devices faceplates, inserts, and specialty mounting bezels. Where indicated, provide connectivity outlets and modular inserts.

F. Fiber Optic / UTP (including Category 6, 6 Augmented) Cabling Radius: Provide each pole with a proper bend radius entrance fitting, which meets or exceeds the specifications for fiber optic and UTP cabling and TIA/EIA 569 requirements for communications pathways.

2.6 ARCHITECTURAL COLUMNS

A. Architectural columns can consist of vertical chase and multi-outlet systems to provide a wire pathway such as conduit and access point for communications and power. System shall consist of modular vertical channels and appropriate fittings as required for a complete assembly.

B. Provide connectivity outlets and modular inserts for UTP (Category 6, 6 Augmented F/UTP). Fiber Optic, Coaxial and other cabling types with faceplates and bezels to facilitate mounting.

2.7 WIRE MESH CABLE TRAYS-Light to Medium Use:

A. Wire mesh cable tray shall not be used within ER's or TR's.

B. All wire mesh cable trays and accessories shall be submitted for approval by UNMH IT.

C. Furnish and install wire mesh cable tray system from the telecommunications room, in hallways and corridors in accessible areas to complete a distribution infrastructure.

D. DESIGN EXCEPTION: When a large quantity of cables are entering ER/TR cable tray shall be used to accommodate the additional weight, the requirements for this design shall include a minimum of 10 feet of cable tray in each area approaching the ER/TR as specified by UNMH IT. Ensure proper bonding, transition and supports between types of systems are maintained according to manufacturer's instructions.

E. Wire Mesh Cable tray will consist of continuous, rigid, welded steel wire mesh cable management system, to allow continuous ventilation of cables and maximum dissipation of heat, with UL Classified splices where tray acts as Equipment Grounding Conductor (EGC).

F. Provide manufacturer splices, supports, and other fittings necessary for a complete, continuously grounded system installed per manufacturer's recommendations. **No single center support systems.**

G. Cable Tray Size:
1. Depth: Cable tray minimum depth shall be 2" inches.
2. Width: Cable tray width will be designed per project.

H. Fill Ratio: Cable tray may be filled to 40% of total fill capacity on initial installation. Size cable tray to accommodate future cabling changes or additions.
   1. Load Span Criteria:
      a. Install and support cable management system in accordance with manufacture specification.

I. Supports
   1. Ceiling-mounted supports shall be mounted directly to the ceiling structure with a minimum of 3/8" inch or ½" inch threaded rod and shall have a maximum of three threads beyond the nut.
   2 Wall-mounted supports where specified are acceptable and shall be installed per manufacturer's specifications.
   3 Cable tray support systems to be installed within raised floor systems shall be installed per manufactures specifications or a minimum of 5/8" inches off floor.

J. Splices, including those approved for electrical continuity (bonding), as recommended by wire mesh cable tray manufacturer.

K. Accessories: As required to protect, support, and install a wire mesh cable tray system. Waterfall shall be used wherever cable enters or exits tray or cable changes elevations without supports.

L. Grounding
   1. Ground per manufacture and NEC Article 250.

2.8 CABLE TRAYS - Ladder Type

A. All ladder type cable trays, devices and accessories shall be submitted to and approved by UNMH IT.

B. Provide metal cable trays with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.
   1. Material and finish specifications for each tray type are as follows: Aluminum or Steel.
   2. Ladder type trays shall consist of two longitudinal members (side rails minimum four inches) with transverse members (rungs) attached to the siderails. Rungs shall be spaced 6", 9" or 12" inches on center. Spacing in radiuses fittings shall be 9" inches and measured at the center of the tray's width. Rungs shall have a minimum
      cable-bearing surface of 7/8" inch with radiuses edges. No portion of the rungs shall protrude below the bottom.
      ****Each rung must be capable of supporting the maximum cable load, with a safety factor of 1.5 and 200 pounds concentrated load when tested in accordance with NEMA VE-1, section 5.4.**

C. Tray widths shall be minimum 12" inches or as shown on drawings.

D. All fittings must have a minimum radius of 18" inches.

E. Straight tray sections shall have side rails fabricated as I-Beams. All straight sections shall

be supplied in standard lengths, except where shorter lengths are permitted to facilitate tray assembly lengths as shown on drawings.

F. Splice plates shall be the bolted type as per manufacture. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing
rated loading capacity of the cable tray.

G. Cable Tray Supports: Shall be placed so that the support spans do not exceed maximum span per manufacture and NEC load rating. Supports shall be constructed from 12 gauge steel formed shape channel members 1 5/8" inch by 1 5/8" inch with necessary hardware, Unistrut or equal. Trapeze hanger's supports shall be supported by ½´ inch (minimum) diameter rods. Cable trays installed adjacent to walls shall be supported on wall mounted brackets. Support shall be loading condition with a safety factor of 3.

H. Barrier Strips: Shall be placed as required.

I. Accessories - special accessories shall be furnished as required to protect, support, and install a cable tray system. Accessories shall consist of but are not limited to; section splice plates, expansion plates, blind-end plates, specially designed ladder dropouts, barriers, etc.

2.9 NON-CONTININOUS CABLE SUPPORTS – J-HOOKS

A. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables (CAT 6 and Cat 6 Augmented); UL Listed.

B. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.

C. Non-continuous cable supports shall have an electro-galvanized finish and shall be rated for indoor use in non-corrosive environments.

D. Saddle can be installed as approved by UNMH IT.

2.10 HORIZONTAL CONDUIT DISTRIBUTION

A. Furnish and install 4" inch EMT conduits in inaccessible areas to complete distribution infrastructure. Provide sufficient conduit capacity to meet the cabling capacity of the cable tray system. Furnish and install pull strings and bushing for conduit sections.

B. Hinged pull boxes with the opening completely assessable from below without obstructions. Install as required per TIA/EIA where conduit runs exceed 100 feet and/or bend exceed a total of 180 degrees in a section of conduit. Pull boxes sized per BICSITDMM.

2.11 FIRESTOP

A. Furnish and install re-enterable UL listed fire rated assemblies through fire rated partitions, walls and floors. Installed per UL system assembly requirements.

B. Fire Rated Cable Pathways: Hilti Speed Sleeve, STI EZ-PATH™, and Wiremold modules comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:
   1. Hilti Speed sleeve CP 653.
   2. Specified Technologies Inc. (STI) EZ-PATH™ Fire Rated Pathway.
   3. Wiremold FS4R for conduit.

C. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re- enterable products that do not cure or dry. Submittals shall be submitted to UNMH IT for approval.

D. Cable trays shall not penetrate fire rated walls or partitions and floors. Use UNMH IT approved fire rated assembly to penetrate walls floors.

2.12 INTRA BUILDING INFRASTRUCTURE

Part 3: EXECUTION

3.1 GENERAL REQUIREMENTS

A. The intent of the telecommunications pathways is to provide the building with a route from the building's ER/TR's and spaces to the TO's at the end user's work area or equipment termination point.

B. All products are to be installed per the manufacturer's instructions and procedures.

C. The installation of new pathways shall not interfere with existing utilities or pathways. The contractor shall coordinate the installation of the new pathways with other trades and project requirements. Minimum clearances shall be 6" inches on sides 3 inches below and 12" inches above.

D. All new pathways must remain accessible and useable after completion.

E. All new pathways must comply with the list of related references listed in Part 1 of this section and comply with installation instructions and methods specified by the products manufacturer.

F. The contractor shall reference the related sections listed in Part 1 to determine any additional requirements necessary to complete the project.

3.2 TELECOMMUNICATIONS OUTLETS

A. New construction telecommunications outlets shall be installed a minimum of 18" inches AFF unless specified.

B. The telecommunications outlet box will be a 4-11/16" inch square box with a 1" extension ring fitted with a single gang mud plate.

C. The telecommunications outlet shall be provisioned minimum with a 1" inch EMT conduit that has bushings installed and a measured pull line installed and secured at the conduits terminations points

D. Telecommunications outlets are not to be installed back-to-back.

E. Firestop the outlet box using a listed UL application in firewalls.

F. Renovated Areas of Existing Buildings Alternate – When approved by UNMH IT.
1. In accessible ceiling areas, extend the conduit through the wall plate and bend the conduit 90º to face the nearest cable tray, or access conduit or sleeve.

G. Provide minimum of one (1) 2" inch EMT sleeves on non-rated walls from the cable tray into each room. On fire rated walls use UNMH IT approved firestop sleeve as per 2.11 Firestop. In inaccessible or semi accessible ceiling areas, install a complete 1" inch minimum EMT conduit system from the telecommunications outlet box to the nearest or most available cable tray.

E. Install system Category compliant cable supports every 36" to 60" inches.

F. Conduit needs to run in the most direct route possible, parallel with building lines and in a workman like manner.

G. The use of flexible metallic conduit is not permitted.

H. Specify UL listed firestopping application for conduit and sleeve penetrations using a code compliant and re-enterable application as per 2.11 Firestop. Document and provide to owner a photograph of the application, the name of the listed application, date of installation and the name of the installer.

3.3 GENERAL CONDUIT REQUIREMENTS

A. Horizontal conduit routes are to be designed to enable the cabling system to meet the link length requirements of 295 feet.

B. Intra building conduit runs shall contain no continuous sections longer than 100 feet. If runs total more than 100 feet, pull points or pull boxes need to be inserted.

C. Conduit shall have no more than 180 degrees of cumulative bends between pull points or more than 90 degrees of bends at any one point.

D. The use of a third conduit bend is only acceptable if:
1. The total conduit run does not exceed 33' feet.
2. The conduit is increased to the next trade size.
3. One of the bends is located within 12" inch of the cable feed end.

F. Pull boxes are not to be used as a means to change the direction of conduit runs. Pull boxes are to be sized as per the latest version of the BICSI TDMM.

G. The use of EB's is not permitted. Only approver LB type bodies that are manufactures for the use with communications cabling.

H. Specify UL listed firestopping application for conduit and sleeve penetrations using a code in the firestopping section we tell the contractor to use Hilti or STI compliant and re-enterable application as per 2.11 Firestop. Document and provide to owner a photograph of the application, the name of the listed application, date of installation and the name of the installer.

I. The following table provides general guidelines for cable capacity for conduits that have no more than two 90º bends and are not longer than 100 feet. It is based on a maximum 40% fill and includes a de-rating factor of 15 % for each of the two 90º bends. The final conduit design shall be compliant with the Related References in Part 1. The radius of conduit bends shall be at least 10 times the conduit diameter. Under certain conditions where 10 times bend radius is not achievable due to structural conditions 6 times bend radius may be permitted by UNMH IT.

Table 1 – Maximum Conduit Fill for Horizontal Cables Number of Cables or Wires

Wire O.D. mm	3.3	4.6	5.6	6.1	7.4	7.9	9.4	13.5
in)	(.13)	(.18)	(.22)	(.24)	(.29)	(.31)	(.37)	(.53)
Conduit size								
1	8	8	7	6	3	3	2	1
1 ¼	16	14	12	10	6	4	3	1
1 ½	20	18	16	15	7	6	4	2
2	30	26	22	20	14	12	7	4
2 ½	45	40	6	30	17	14	12	6
3	70	60	50	40	20	20	17	7
3 ½	-	-	-	-	-	-	22	12
4	-	-	-	-	-	-	30	14

3.4 INTER BUILDING BACKBONE CONDUIT REQUIREMENTS

A. All conduits for backbone cabling shall be 4".

B. Conduits entering telecommunications or equipment rooms from below floor shall be terminated not more than 4" above finished floor.

C. Conduits for riser cables shall be continuous and separate from all conduit or enclosed raceway systems. Do not include more than two 90º bends between pulling points when installing riser conduits. Where junction boxes are required they must be hinged type boxes and located in accessible areas, such as above suspended ceilings in hallways.

D. Factory bends are required for backbone conduit installations.

E. A 40" inch bend radius is to be maintained at all turns in.

F. A change in direction of the conduit run is not to be accomplished by adding a pull box.

G. UNMH IT preferred method for Optical Fiber is to utilize Interlocking Armored Cable which is appropriately color coded, without the use of innerduct or max-cell.

H. Where specified by UNMH IT install one (1) 1 1/4" inch plenum rated inner ducts for each optical fiber cable specified in all cable tray installations.

I. Label optical fiber inner ducts at each end within Six feet of the rack and within One foot of entering or exiting a conduit, label shall be preprinted caution labels that indicate optical fibers cables and describe the size and the termination points of the installed cable. Labels must be yellow with black text and waterproof.

J. Install a single conductor locating wire of minimum 14 gauge solid insulated orange wire for all non-metallic optical fiber cables and terminate on cable's FDU.

K. All multi-cell conduit and innerducts and multi-cell innerduct shall be rated per NFPA 70 requirements.

L. Conduits entering entrance, equipment or telecommunications rooms from below grade shall extend 4" inches above finished floor. Location of entrance conduits shall be within 12" inches of room corners.

M. Terminate conduits entering entrance, equipment or telecommunications rooms from above ceiling extend conduit 4" inches below finished ceiling or 12" inches above cable tray.

N. Entrance conduits shall be continuous into the building and to the entrance, equipment or telecommunications rooms. Securely fasten all entrance conduits to the building to withstand any cable placing operation.

O. If the entrance conduits exceed the 180º of total bends limitation, an appropriate sized junction box, manhole, or handhole is required.

P. All conduits shall have a measured 1320 pull strength mule tape installed and tied off a teach end.

3.5 SURFACE MOUNTED RACEWAYS

A. Install sufficient conduit capacity from the cable tray to Surface Mounted Raceways(SMR) to provision the cabling capacity of all outlets in the raceway system.

B. Fit out each outlet in the SMR with parts and accessories necessary to install the specified

cabling system.

C. Furnish and install raceway and boxes for renovations daily work orders. The minimum cabling capacity of the SMR shall be one inch. Provide a complete system using approved manufacturer parts and methods. Secure raceway system using screws and attachments. Install a minimum of three support screws per raceway section. Do not use adhesive strips as a final means of support.

3.6 CORRIDOR CABLE TRAY SYSTEM

A. Complete wall mounted or suspended aluminum or stainless cable tray system and necessary accessories shall be provided as shown on plans. Install entire cable tray system in accordance with manufacturer's minimum installation practices and all local governing codes.

B. Coordinate installation of cable tray with other trades to allow a minimum of 12" inches above, 6" inches in front, and 3" inches below of clearance from piping, conduits, ductwork, etc.

C. Submittal drawings, in the form of 8 ½" inch by 11" inch catalog cut sheets, shall be provided for the following items: cable tray, fittings, accessories and load data.

D. Cable tray shall not be loaded beyond 60% of manufacturer's recommended load capacity.

E. Coordinate cable tray installations with other trades.

F. Where a new cable tray distribution system encounters an inaccessible area, install sufficient 4" inch EMT sleeves through the area so cabling does not exceed 40% fill ratio.

G. Where cable tray is exposed below ceiling and accessible to the public, install the appropriate solid bottom and cover inserts to conceal cables.

H. Install the appropriate cable tray waterfalls and/or cable exits where large quantities of cables exit the distribution system.

I. Install one 1 1/4" inch plenum rated inner ducts for each optical fiber cable specified in all

cable tray installations, except where Interlocking Armored Optical Fiber is installed.

J. Label optical fiber inner ducts every start and end points and on each of a wall with preprinted caution labels that indicate optical fibers cables and describe the size and termination points of the installed cable. Labels must be yellow with black text and waterproof.

3.7 TELECOMMUNICATIONS ROOM CABLE TRAY SYSTEM

A. TR cable tray shall completely wrap all walls within the room. Cable tray shall extend over all equipment racks.

B. Cable tray shall be a minimum width of 18" inch.
C. Typical cable trays installations will be at nine feet AFF or one foot above equipment racks.
D. Bond and ground cable tray system to equipment racks using manufacturer approved methods and products.

E. See section 2.08 Cable Trays-Ladder Type

3.8 JUNCTION BOX REQUIRMENTS FOR STATION CONDUITS

A. If the station conduit route exceeds the 180 º of total bends limitation, an appropriately sized junction box is required within a straight section of the conduit run.

B. A junction box shall not be used in place of a bend. All junction boxes in station conduit paths shall be installed within a straight section of the conduit run.

C. Junction Box Requirements for Station Cables.

JUNCTION BOX REQUIRMENTS FOR STATION CONDUITS			
Conduit size	Size of Box		
	width	length	depth
¾"	4"	4"	3.5"
1"	4-11/16"	4-11/16"	3.5"
1-¼"	6"	6"	4"
1-½"	6"	6"	4"
2"	8"	8"	4"
2-¼"	12"	12"	6"
2-½"	12"	12"	6"

3.9 FIRESTOP

A. Telecommunications pathways requiring fire stopping shall utilize UL listed re-enterable fire stopping assemblies. See Section 2.11 Firestop (Hilti, STI or Wiremold).

B. In all buildings, floor/ceiling assemblies, stairs, and elevator penetrations shall be sealed with a 2-hour fire stop assembly at a minimum, unless otherwise noted.

C. Provide restorable fire stops inside and around conduits as recommended by UL1479 or ASTM E814 for all conduits penetrating fire-rated construction. Fire-rated construction to be verified with UNMH/IT. All fire stopping penetrations must be photographed labeled with the UL1479 or ASTM E814 reference number, dated, and signed by the technician who installed the fire stopping material. Submit firestop documentation to UNMH IT prior to final electrical inspection.

END OF SECTION

SECTION 27 1523

FIBER OPTIC CABLE

PART 1 – GENERAL

1.1 DESCRIPTION

A. This item shall govern for the furnishing and installation of fiber optic cable in designated locations as shown on the plans and as detailed in accordance with these Specifications.

1.2 MATERIAL

1.3 GENERAL REQUIREMENTS

A. All materials furnished, assembled, fabricated or installed under this Item shall be new, corrosion resistant and in strict accordance with the details shown on the plans and in the specifications.

B. The Contractor shall furnish, install, splice and test all the required fiber optic cable. All splicing kits, fiber optic cable caps, moisture/water sealants, terminators, splice trays, pig tails and accessories to completed the fiber optic network shall be provided as incidentals. All equipment for installation, splicing and testing shall be provided by the Contractor.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. The fiber optic cable shall be the primary central to field communications medium for voice, data and video. The cable shall be suitable for installation in an underground three-inch conduit environment including constant immersion in water. All cable shall be non-metallic.

B. All fibers in the fiber optic cable shall be spliced and/or terminated as shown on the plans and as specified herein.

C. All fiber optic glass shall be from the same manufacturer.

2.2 OPTICAL REQUIREMENTS

2.3 CABLE CONFIGURATION

A. Single mode: 8.3 micron core, attenuation .7 dB/km maximum at 1310 nm.

B. Multimode mode: 50 micron core, attenuation 1.2 dB/km maximum at 1300 nm with a bandwidth range of 500 to 1100 MHz.

C. Multimode mode: 62.5 micron core, attenuation 2.7 dB/km maximum at 1300 nm with a bandwidth range of 300 to 700 MHz.

2.4 MECHANICAL REQUIREMENTS – FIBERS

A. The quantity of fibers contained in the fiber optic cable shall be as shown on the plans.

B. The fibers shall have a nominal core diameter of 8 to 10 microns. Fiber outer diameter shall be 125 plus or minus 3 microns.

2.5 CORE/CLAD CONCENTRICITY

A. Core/Clad concentricity shall be within plus or minus 1 micron.

2.6 PRIMARY COATING

A. Each fiber shall have a high density polymer coating of a minimum of 250 micro meters to prevent abrasion of the fiber surface or as approved by the Architect/Engineer.

2.7 BUFFERING

A. Individuals fibers shall be enclosed in oversized plastic tubes which are filled with a non-hygroscopic compound, or coated with a heavy polymer coating and enclosed in a tight flexible thermoplastic jacket to provide strength for practical handling, to prevent microbends and to preserve the individual fibers during installation and long-term service.

2.8 TENSILE STRENGTH

A. The cable shall be capable of withstanding a pulling tension of 600 lbs. without changing the characteristics of the optical fibers. Requirements for a higher pulling tension shall be provided as directed by the Architect/Engineer.

2.9 BEND RADIUS

A. The cable shall be capable of withstanding a minimum bending radius of 10 times its outer diameter during operations and 20 times its outer diameter during installation without changing the characteristics of the optical fibers.

2.10 CABLE CONFIGURATION

A. The fiber optic cable shall have a reverse oscillation or planetary stranding structure.

B. In each cable, the buffered fibers shall be grouped to the degree practical, either in separate unit tubes, layers or sub-bundles. Each grouping shall be distinctly color coded for quick and easy identification, even in dim light. Jacket construction and the configuration of the groups shall be such that they can easily be separated at splice points, permitting one set of fibers to be cut and spliced while the others remain continuous. The Contractor shall submit proposed cable designs for the Architect/Engineer’s approval prior to procurement and installation of cable plant.

C. All strength members shall be Kevlar or as approved by the Architect/Engineer and shall provide the cable with the specified strength.

D. The cable shall be fully filled with non-hygroscopic water blocking compound to prevent water and moisture penetration.

E. The Contractor shall also demonstrate crush and abrasion resistance of final cable design and adequacy for conduit installation under full tensile loads and multiple bends.

2.11 DIAMETER

A. The outer diameter of each cable shall be less than 1/2 inch.

2.12 COLOR CODING

A. Each fiber buffer jacket shall be color coded separately. Within unit tubes or sub-bundles, each fiber shall have a distinctly different color coding.

2.13 INSTALLATION REQUIREMENTS

A. The fiber optic cable installation techniques shall be such that the optical and mechanical characteristics of the cables are not degraded at the time of installation.

2.14 EXPERIENCE REQUIREMENTS

A. The Contractor involved in the installation, splicing and testing of the fiber optic cable shall meet the following requirements:
   1. Three (3) years experience in the installation of fiber optic cables, including fusion splicing terminating and testing of single mode fibers.
   2. Two (2) installed systems where fiber optic cables are installed in outdoor conduits and the systems are in continuous satisfactory operation for at least two (2) years. The Contractor shall submit as proof, photographs or other supporting documents, and the names, addresses and telephone numbers of the customers' operating and maintenance personnel who can be contacted regarding the fiber optic systems.
   3. One (1) fiber optic cable system (which may be one of the two in the preceding paragraph) which the contractor can arrange for demonstration to the Architect/Engineer and/or his representatives.
   4. Splicers shall have been trained and experience on the specific splicing equipment to be used.

2.15 INSTALLATION IN CONDUIT

A. The cable pulling operation shall be performed so that the minimum bending radius of the cable shall not be exceeded in the unreeling and pulling operations. Entry guide chutes shall be used to guide the cable into the pull-box conduit ports. Lubricating compound shall be used to minimize cable-to-conduit friction. Corner rollers (wheels), if used, shall not have radii less than the minimum installation bending radius of the cable. A series array of smaller wheels can be used for accomplishing the bend if the array is specifically approved by the cable manufacturer. The pulling tension shall be continuously measured and it shall not be allowed to exceed the maximum tension specified by the manufacturer of the cable. Fuse links and breaks shall be used to insure that cable tension shall not exceed 600 lbs.

B. When simultaneously pulling fiber optic cable with other cables, separate grooved rollers shall be used for each cable.

C. Conduits shall be sealed with a two part urethane after cable installation.

D. Cable Installation between Pullboxes and Cabinets.

E. When pulling the cable from the nearest manhole to the fiber hub the cable shall not be broken or spliced to a second interconnecting cable to complete the run. The cable shall be pulled through the hub while terminating only the fibers for the fiber optic terminal equipment. All remaining fibers shall remain continuous with no splices. Care shall be taken during this procedure to avoid bending the cable beyond its minimum bend radius.

2.16 SPLICING REQUIREMENTS

A. All optical fibers shall be spliced or terminated by the Contractor as shown in the splicing diagrams in the plans. Splices shall be allowed only in locations as shown within the plans or as directed by the Architect/Engineer.

B. All splices shall use the fusion technique. Fusion splicing equipment shall be provided by the Contractor and shall be cleaned, calibrated and specifically adjusted to the fiber and environmental conditions at the start of each shift. Fusion splicing equipment used shall be approved by the Architect/Engineer. Splice enclosures, organizers and incidentals, and cable end preparation tools and procedures, shall be compatible with the cable type being delivered and approved by the Architect/Engineer.

C. Each spliced fiber shall be packaged in a protective sleeving or housing. Bare fiber shall be completely re-coated with a protective 8 RTV, gel or similar substance, prior to application of the sleeve or housing, so as to protect the fiber from scoring, dirt or microbending.

D. Rack mounted organizer trays shall be used to hold the spliced fibers, with each fiber neatly secured to the tray.

E. All fibers shall be terminated or spliced inside fiber optic cable interconnect panel modules. The module is to be fully enclosed unit capable of supporting the specified cables shown within the plans.

F. The interconnect panel modules shall be nineteen inch rack mountable or as shown on the plans and compatible with any existing equipment.

G. Each module shall be able to support a minimum of 48 ST connectors in bulkheads.

H. The splice trays shall be capable of holding either fusion splices or mechanical splices.

I. The cabinets will contain cabinet mounting brackets with four outside plant cable clamps for strain relief. The cable shall be installed according to the manufacturer’s recommended standards for the cable distribution panel selected.

J. A maintenance loop of at least five feet of cable will be coiled up and teed inside the interconnect module. This will allow for future splices in the event of a damaged splice. “Pigtails” shall be used to interconnect equipment.

K. Splice loss shall not exceed a 0.07 dB.

L. Splices that are made between two cables shall be tested using an Optical Time Domain Reflectometer (OTDR). These splices shall be tested at the required wavelength and printouts of the splice tests shall be provided.

2.17 TERMINATION REQUIREMENTS

A. In cabinets where the optical fibers have to be connected to terminal equipment, the Contractor shall provide matching connectors.

B. The connector loss for complete connection to the terminal equipment shall not exceed 0.4 dB. Connectors will be qualified and accepted on the basis of connector-to-connector mating using similar fibers.

C. In the Control Center and at the ends of the system, 60 inches of the unused optical fibers shall be removed from the buffer tube(s) and the coiled fibers placed into a splice tray approved by the Architect/Engineer. The water blocking compound shall be cleaned from all fibers destined for splice tray usage.

2.18 FIBER OPTIC JUMPERS

A. Fiber optic jumper cables shall be provided to cross connect the cable distribution panel to the fiber optic transmission equipment. These jumpers shall be orange in color for the multimode fiber, yellow in color for single mode fiber and shall have strain relief on the connectors. The fiber shall have a 900 micron or 1000 micron polymer coating with tight buffer tube, Kevlar strength member and a PVC jacket.

B. The jumpers shall be one meter in length or as directed by the engineer. One end of each jumper shall have an ST connector and the other end shall have a connector that is suitable to be connected to the fiber optic transmission equipment selected.

C. The Contractor shall inspect the Fiber Distribution Frame and provide all necessary items to terminate the fibers.

2.19 ENVIRONMENTAL REQUIREMENTS

A. The cable shall function within specifications over its full life time for a temperature range of -20F to 180 F, and when totally immersed in water for indefinite periods of time.

PART 3 - EXECUTION

3.1 GENERAL

A. The installation of the cable, the splicing of the fibers, the attachment of connectors and mounting of hardware in cabinets and the methods employed in the above “Mechanical Requirements” sections shall utilize the latest available installation machinery, jacking

equipment, cable pulling machinery with appropriate tension monitors, splicing equipment and testing equipment and other miscellaneous tools.

B. All installation techniques and fixtures shall result in ease of maintenance and ready access to all components for testing and measurements.

3.2 MECHANICAL COMPONENTS

A. All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be used unless specifically approved by the Architect/Engineer.

B. All parts shall be made of corrosion resistant material, such as plastic, anodized aluminum or brass.

C. All materials used in construction shall be protected from fungus growth and moisture deterioration.

D. Dissimilar metals shall be separated by an inert dielectric material.

3.3 DOCUMENTATION REQUIREMENTS

A. Ten (10) complete sets of operation and maintenance manuals shall be provided. The manuals shall, as a minimum, include the following:
1. Complete and accurate schematic diagrams showing the fiber optic cable plant.
2. Complete performance data of the cable plant showing the losses at each splice joint and each terminal connector.
3. Installation, splicing, terminating and testing procedures.
4. Complete parts list including names of vendors.
5. Complete maintenance and trouble-shooting procedures.
6. Two (2) months prior to installation, ten (10) copies of the Contractors Installation Practices shall be submitted for approval. This shall include practices, list of installation equipment, and splicing and test equipment. Field quality control procedures shall be detailed as well as procedures for corrective action.

3.4 TESTING REQUIREMENTS – GENERAL

A. It is the policy of the Department to require performance testing of all materials and equipment not previously tested and approved. If technical data are not considered adequate for approval, samples may be requested for test by the Architect/Engineer. The contract period will not be extended for time lost or delays caused by testing prior to final Department approval of any items.

B. The equipment covered by the specification shall be subject to Design Approval Tests and Factory Demonstration Tests at the equipment manufacturer’s facility to determine conformance with all the specification requirements except that the Engineer may accept certification by an independent testing lab in lieu of the Design Approval Tests, to verify that the Design Approval Test have previously been satisfactorily completed. The Contractor shall arrange for and conduct the test in accordance with the testing requirements stated herein.

C. Unless otherwise specified, the Contractor is responsible for satisfying all inspection requirements prior to submission of the Architect/Engineer's inspection and acceptance. Architect/The Engineer reserves the right to have his/her representative witness to all tests.

D. The results of each test shall be compared with the requirements specified herein. Failure to conform to the requirements of any test shall be counted as a defect, and equipment shall be subject to rejection by the Architect/Engineer. Rejected equipment may be offered again for retest provided all non-compliances have been corrected and re-tested by the Contractor and evidence thereof submitted to the Architect/Engineer.

E. Final inspection and acceptance of the fiber optic cable shall be made after the completion of the installation and testing and approval of the documentation described above.

3.5 MANUFACTURER'S CERTIFICATION

A. Each reel of fiber optic cable shall be accompanied by the manufacturer's test data showing the conformance to the requirements described in this Special Specification.

3.6 PRE-INSTALLATION TESTS

A. The fiber optic cable shall be tested at the site storage area prior to installation.

B. Each optical fiber in the cable shall be tested from one end with an OTDR compatible with wavelength and fiber type. Testing shall check for continuity, length, anomalies, and approximate attenuation. Each measurement will be recorded with color, location and type of fiber measured. In the event that a meaningful measurement cannot be made from on end, it shall be performed from the opposite end of that fiber. If the tested loss per Km exceeds the loss from the manufacturer's test data the Architect/Engineer shall reject the cable.

3.7 POST-INSTALLATION

A. After installation, each optical fiber in the cable shall be tested again for the loss characteristics. Both directions of operation of the fiber shall be tested.

B. After each splice and connector installation, the cable shall also be tested and the data shall be submitted to the Architect/Engineer as basis for acceptance. OTDR and/or power meter/optical light source testing equipment, as specified by the cable manufacturer, shall be used for this testing.

3.8 TEST PROCEDURE

A. The Contractor shall prepare and submit all test procedures and data forms for the pre-installation and post-installation tests to the Architect/Engineer for approval. The Contractor shall furnish data forms containing all of the data taken, as well as quantitative results for all tests. The data forms shall be signed by an authorized representative of the Contractor. At least one copy of the data forms shall be sent to the Architect/Engineer.

3.9 TRAINING CLASS

A. The Contractor shall conduct a training class (minimum of forty (40) hours) for up to ten (10) representatives designated by the Department on procedures of installation, splicing, terminating and testing of fiber optic cable. Training material shall include, as a minimum, code compliance, pulling and installation techniques, use of installation tools, splicing and terminating equipment and test instruments and methods of recording installation and test data. The Contractor shall submit to the Architect/Engineer for approval, ten (10) copies of the training material at least thirty (30) days before the training begins.

3.10 MEASUREMENTS

A. This Item will be measured by the linear foot of cable furnished, installed, spliced, connected, and tested in accordance with these specifications.

END OF SECTION

SECTION 28 0500

GENERAL ELECTRONIC SAFETY AND SECURITY PROVISIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract, including General Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 REQUIREMENTS OF REGULATORY AGENCIES AND STANDARDS

A. Regulatory Agencies: Installation, materials, equipment and workmanship shall conform to the applicable provisions of the National Electrical Code (NEC), the National Electrical Safety Code (NESC), Occupational Safety and Health Act (OSHA) all local, state and national codes, ordinances and regulations governing the particular class of work involved and the terms and conditions of the electrical utility and other authorities having lawful jurisdiction pertaining to the work required. All modifications required by these codes, rules, regulations and authorities shall be made by the Contractor without additional charge to the Owner. The Contractor shall secure all permits and licenses required for his work and shall pay all fees in connection with such permits and licenses.

B. On completion of the various parts of the work, the installation shall be tested by the constituted authorities and approved; and, on completion of the work, the Contractor shall obtain and deliver to the Owner, final certificates of acceptance. The Contractor shall furnish copies of each certificate to the Architect/Engineer.

C. Underwriter's Laboratories (UL): All materials, appliances, equipment or devices shall conform to the applicable standards of Underwriter's Laboratories, Inc. where such standards have been established.

D. Standards: The current edition of the following specifications and standards shall form a part of these specifications:

1. National Fire Protection Association Standards
2. National Electrical Code, NFPA 70 (NEC)
3. Life Safety Code, NFPA 101
4. NFPA 72
5. Occupational Safety and Health Act (OSHA)
6. National Electrical Safety Code (NESC)
7. Underwriter's Laboratories, Inc. (Standards)
8. American National Standards Institute (ANSI)
9. American Society of Testing and Materials (ASTM)
10. Institute of Electrical and Electronic Engineers (IEEE)
11. Insulated Cable Engineer's Association (ICEA)
12. National Electrical Manufacturer's Association (NEMA)
13. Americans with disabilities Act Accessibility Guidelines (ADA)

1.3 DRAWINGS

A. The electrical drawings show the general arrangement of all conduit, outlets, equipment, etc. and shall be followed as closely as actual building construction and the work of other trades will permit. The architectural and structural drawings shall be considered as a part of the work insofar as these drawings furnish the Contractor with information relating to the design and construction of the building. Architectural drawings shall take precedence over electrical drawings. Because of the small scale of the electrical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, elbow, pullboxes, and accessories as may be required to meet such conditions.

B. The Contractor shall verify the dimensions governing the electrical work at the building. No extra compensation shall be claimed or allowed because of differences between actual dimensions and those indicated on the drawings.

C. Drawings and specifications shall be considered as complementary. Work or materials called for by one and not mentioned in other shall be provided as though treated by both.

D. In the case of conflict between drawings and specifications, the greater or more restrictive requirement shall apply.

E. Any question as to the intent of the drawings or specifications shall be referred to the Architect/Engineer, whose decision shall be final and conclusive.

F. Should the Contractor observe any conflict or variation in the plans and specifications, he shall notify the Architect/Engineer in writing no later than seven (7) days prior to date of bid opening. Failure to clarify such variations will result in the Contractor bearing all costs arising from electrical work necessary to resolve the conflict or variation.

1.4 AS-BUILT DRAWINGS

A. During progress of the work, the contractor shall maintain an accurate record of the installation of the system, locating each outlet, and note all circuiting deviations from the contract drawings. Upon completion of the installation, the contractor shall transfer all record data to a single neat and legible set of blue line prints of the original drawings.

1.5 OPERATING INSTRUCTIONS AND MANUALS

A. Instructions: Without additional charge to the Owner, furnish competent instruction to the Owner in the care, adjustment and operation of all parts of the electrical equipment and systems.

B. Manuals: Upon completion of the work, prepare and deliver to the Owner two (2) sets of complete operating and maintenance manuals for the systems and major equipment installed, suitably bound in book form and must be originals. Include catalog data, shop drawings, wiring diagrams, performance curves and rating data, spare parts lists and manufacturer's operating and maintenance data.

C. Other: The above requirements are in addition to specific instructions and manuals specified for individual systems or equipment.

1.6 SITE VISIT

A. The Contractor shall visit the site prior to bidding and satisfy himself as to the conditions under which the systems are to be installed. No subsequent allowance shall be made in his behalf for failure to make such a visit.

1.7 FIELD MEASUREMENTS

A. The Contractor shall verify the dimensions covering the work. No extra compensation shall be claimed or allowed due to difference between actual dimensions and those indicated on the drawings. No waiver of responsibility for defective work shall be claimed or allowed due to failure to report unfavorable work conditions affecting the work.

1.8 PERFORMANCE TESTS

A. Thoroughly test all fixtures, batteries, services and all circuits for proper operating condition, required durations and freedom from grounds and short circuits before acceptance is requested. All equipment, appliances and devices shall be operated under load conditions.

B. After the interior wiring system installation is complete and at such time as the Architect/Engineer may direct, conduct operating tests for approval. When requested, test all the wire, cable, devices and equipment after installation, to assure that all material continues to possess all the original characteristics as required by governing codes and standards listed in these specifications.

C. Perform such other tests as required by other sections of these specifications or as requested to prove acceptability.

D. Furnish all instruments and labor for testing.

1.9 REMODELING WORK

A. Where remodeling work is indicated, the Contractor shall be responsible for all electrical work associated with changes in, or removals of existing walls, ceilings or floors. This work shall include rerouting of conduits, relocation of fixtures, devices and conduits as well as provision for circuit continuity for circuits in remodeled areas. The cost of all of this work shall be included in the Contractor’s price with no additional compensation allowed for failure to include this work.

1.10 MISCELLANEOUS ITEMS

A. Miscellaneous items not covered in these specifications shall be as indicated on the drawings, installed and connected in the proper manner and as recommended by the manufacturer.

1.11 GUARANTEE

A. All equipment and workmanship to be furnished under this contract shall be guaranteed for a period of one year from the date of final acceptance thereof against defective materials, design and workmanship. Upon receipt of notice from the Owner of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be replaced promptly with new parts by and at the expense of the Contractor. The labor incident to the installation of these replacements shall be furnished by the Contractor.

1.12 STANDARDS OF MATERIAL AND WORKMANSHIP

A. All material shall be new and shall bear the label of the Underwriter's Laboratories, Inc., or be listed under re-examination service. All material shall be of the best grade and latest pattern of manufacture as specified. All work shall be performed in a neat, workmanlike manner and shall present a neat mechanical appearance when completed.

PART 2 - PRODUCTS

2.1 EQUIPMENT REQUIREMENTS

A. The electrical requirements for equipment specified or indicated on the drawings are based on information available at the time of design. If equipment furnished for installation has electrical requirements other than indicated on the electrical drawings, the Contractor shall make all adjustments to wire and conduit size, controls, overcurrent protection and installation as required to accommodate the equipment supplied, without additional charge to the Owner. The complete responsibility and costs for such adjustments shall be assigned to the respective section of this specification under which the equipment is furnished.

2.2 MATERIALS

A. When the product of a specific manufacturer is indicated on the drawings or specified herein by catalog number or trade name, it has been done for convenience in fixing the standard for workmanship, finish, design and the guaranteed performance. Any material, apparatus or appliance which the Contractor desires to substitute for those mentioned herein shall also conform to these standards or exceed them and shall follow the procedure as outlined under substitutions and specified herein.

B. All similar materials and equipment shall be the product of the same manufacturer.

C. Where no specific material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be used, providing it conforms to the contract requirements and meets the approval of the Architect/Engineer.

D. Materials and equipment shall be the standard products of manufacturers regularly engaged in the production of such material and shall be the manufacturer's current and standard design.

E. Altitude: Equipment affected by altitude shall perform satisfactorily for the function intended at the altitude of the project site.

2.3 NAMEPLATES

A. All items of mechanical and electrical equipment shall be identified by the attachment of engraved nameplates, constructed from laminated phenolic plastic, at least 1/16" thick, three-ply, black surface and white core. Plates shall be attached by the use of stainless plate screws unless indicated otherwise. Nomenclature on the label shall include the name of the item and feeder circuit number. Equipment to be labeled shall include, but not be limited to, the following:

1. Air Conditioning Control
2. Contactors
3. Panels and Switches
4. Time Switches
5. Relays
6. Disconnect Switches
7. Starters
8. Transformers
9. Miscellaneous
10. Similar and/or related items

2.4 CHANGES

A. No changes shall be made in the electrical work as shown and herein specified, unless such changes are authorized in writing by the Architect/Engineer and such authorization shall contain a statement covering the amount of the charges involved in the change.

2.5 SUBSTITUTIONS

A. On all material, substitutions will be considered only if requested by letter from the Contractor to the Architect/Engineer. Letters must be in the engineer's office no later than 10 days prior to the bid date and shall be considered as authorized only upon written confirmation from the Architect/Engineer. Where materials are proposed to be substituted in lieu of the items specified, substitutions shall be equal in quality, workmanship and design. The burden of proof of equality of materials shall be placed upon the Contractor. Samples of all materials proposed for substitution shall be submitted to the Architect/Engineer, when requested, for examination.

2.6 SHOP DRAWINGS

A. Shop drawings shall be furnished for all equipment and materials. They shall be furnished by the Contractor as required in the Submittal Section. Where equipment will be furnished "as specified," a statement to that effect is sufficient. Where substitutions are proposed, complete data must be furnished showing performance, quality and dimensions.

B. The Contractor shall submit to the Architect/Engineer for checking a complete descriptive and technical data list for all items of material furnished under this contract. Complete outlines, dimensions, electrical services, control diagrams, electrical characteristics of special nature or critical to the installation and pertinent data required for installation shall be shown. Fixture submittals shall include scale drawings showing metal gauges and finish together with complete photometric distribution curves and

coefficient of utilization tables. Glare factor curves shall also be submitted for each fixture. Failure to submit this information can be the basis for disapproval.

C. All descriptive and technical data and shop drawings shall bear signed certification that they have been carefully examined and found to be correct with respect to dimension, space available, non-interference with other trades and that the equipment complies with all the requirements of these specifications. Submittals that have not been checked for compliance will not be considered by the Engineer.

D. Only complete submittals will be considered, partial submittals will not be reviewed.

2.7 SUBMITTALS

A. Submittals shall be complete; bound booklets with an index of all items submitted including associated catalog/part numbers. The Contractor shall make submittals on all the following equipment (in addition to any special items indicated elsewhere in the plans or specifications):

1. Lighting Fixtures
2. Wiring devices
3. Conduit
4. Wire
5. Panelboards
6. Switchgear
7. Fuses
8. Metering equipment
9. Transformers
10. Starters
11. Contactors
12. Disconnect switches
13. Motor Control Centers
14. Lamps
15. Dimming systems
16. Special Systems equipment (Fire Alarm, Intrusion Alarm, Sound, TV, Lightning Protection, etc.).

B. Electrical System Controls

C. After receiving approval on the make and the type of materials, the Contractor shall order such materials in sufficient time to prevent any delay or changes on the job.

PART 3 - EXECUTION

3.1 GENERAL

A. Fabrication, erection and installation of the complete electrical system shall be done in a first class workmanlike manner by qualified personnel experienced in such work and shall proceed in an orderly manner so as not to hold up the progress of the project. The Contractor shall check all areas and surfaces where electrical equipment material is to be installed, removed or relocated and report any unsatisfactory conditions before starting work. Commencement of work signifies the Contractor's acceptance of existing

conditions. In the acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of workmen.

3.2 EQUIPMENT

A. Equipment and materials furnished by the Contractor shall fit the spaces allocated for them. Should the equipment which the Contractor proposes to install, require space conditions other than indicated on the drawings, it shall be the Contractor's responsibility to reconcile the available space with the equipment and make any changes required to accommodate the equipment. All required changes shall be made at the Contractor's expense.

B. All equipment, both the Contractor and Owner furnished, shall be installed in accordance with the manufacturer's recommendations.

3.3 COORDINATION

A. The Electrical Plans are diagrammatic but shall be followed as closely as actual construction and the work of other trades will allow. Such minor changes as are necessary to make the electrical work conform to the work of other trades and to the building shall be made without cost to the Owner.

3.4 CONDUITS

A. In all spaces such as ceiling spaces and equipment rooms, all conduits shall be run to a continuous grade and square to the building.

B. The plans do not give exact details as to the elevations of conduits, exact locations, etc., and do not show all off-sets, bends, junction boxes and other installation details. The Contractor shall carefully lay out his work at the site to conform to details of installation.

3.5 LOCATION OF EQUIPMENT AND OUTLETS

A. The approximate locations of cabinets, panelboards, wiring gutters, switches, light outlets, power outlets, etc., are indicated on the drawings; however, they are not intended to give complete and exact information. Determine the exact location after thoroughly examining the general building plans and by actual measurements during construction, subject to the approval of the Architect/Engineer.

B. Verify with Architect/Engineer, prior to installation, all locations of conduit, boxes, etc. stubbed or in the floor.

3.6 PROTECTION OF MATERIALS AND EQUIPMENT

A. The Contractor shall be responsible for the protection of all materials and equipment under this section of the work whether incorporated into the building or not.

B. The Contractor shall provide protection for all work where necessary and will be responsible for all damage done to property during the construction. The above protection shall be maintained while the work is in progress. In no case shall dirt, grit, etc., be ground into the floor finish or coverings.

C. The Contractor shall provide space for storage of materials and equipment at ground level.

3.7 CUTTING AND REPAIRING

A. Cutting and repairing shall be the responsibility of the Contractor. Coordinate to prevent unnecessary cutting and repairing. Lay out and locate equipment, openings and chases. Install sleeves, inserts and supports.

3.8 EXCAVATION AND BACKFILLING

A. The Contractor shall do all necessary excavation and backfill for the installation of the systems as may be required. Curb cuts, asphalt and concrete patching, etc., shall be part of the Contractor's responsibility. Any required trenching will be done by hand and all existing utilities avoided. Damage done to existing utilities will be repaired by the Contractor with no additional payment for the work. In addition to the above, trenches shall be backfilled with dirt, free from debris, rocks and other foreign matter. Backfill shall be replaced in the trenches in 6" layers and each 6" layer shall be wetted down adequately and properly tamped. Remove surplus dirt and leave premises clean. Perform excavation, backfilling and repaving required for work under this Division in accordance with DIVISION 2, SITE CONSTRUCTION. In general, backfill and tamp with compaction at least equal to that of the surrounding area.

3.9 WARRANTY

A. Deliver originals of all guarantees and warranties on this portion of the work to Owner. Warrant all equipment, materials and workmanship for one year in accordance with the terms of this Contract.

3.10 PRODUCT HANDLING

A. Use all means necessary to protect electrical materials and equipment before, during and after installation and to protect the installed work of other trades. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no extra cost to him.

END OF SECTION

SECTION 28 1600

INTRUSION ALARM SYSTEM

PART 1 - GENERAL

1.1 REQUIREMENTS

A. Conform with applicable provisions of the General Conditions, Special Conditions, and General Requirements.

1.2 RELATED WORK IN OTHER SECTIONS

A. General requirements, conduit, boxes and fittings, wire and cables.

1.3 DESCRIPTION OF WORK

A. Furnish and install all intrusion alarm equipment as scheduled on the drawings and as specified herein.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. The system shall include all wiring, conduit, pull boxes, terminal cabinets, outlet and mounting boxes, door switches, combination infrared/microwave 360 degree motion detectors, and all other accessories and miscellaneous items as required or indicated on the contract drawings.

B. All equipment shall be U.L. approved. The system shall be supplied and installed by a qualified contractor normally engaged in installation and maintenance of alarm systems, with at least five years history of providing factory service in Albuquerque.

C. Door switches shall be triple reed balanced magnet type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All conductors installed shall be continuous from device to device, from device to terminal block or from terminal bock to terminal block. There shall be no wire splices of any kind in junction boxes, wireways, raceways or elsewhere. If a splice in a junction box cannot be avoided, the wires shall be twisted and soldered together. Wire nuts are not acceptable.

B. A primary and auxiliary power source is required. Auxiliary power shall be supplied by batteries or engine driven generator. Switch over to the auxiliary power shall be automatic upon failure of the primary power source, and upon failure of both the primary and auxiliary power sources, a signal shall be generated to indicate an alarm condition at the remote Guard House Monitor.

C. Auxiliary power sources shall be capable of maintaining full operation of the alarm system for not less than six hours.

3.2 ALARM LINE SUPERVISION

A. The line shall be continuously supervised so as to detect any attempts to short, open or substitute a bogus signal for the legitimate "No alarm" signal in an attempt to bypass the alarm system. The system shall be capable of detecting tamper with the system, any components, or the line in both the secure and access modes. #18 solid copper conductors shall be installed to all detection devices. Wire shall be terminated with lugs.

3.3 FINAL TEST AND ACCEPTANCE

A. The contractor shall demonstrate in the presence of an authorized Department of Energy representative the proper operation of each detection device and all control panels, ground fault condition, power failure, battery standby, and specifications and manufacturer's data.

END OF SECTION

SECTION 28 3000

FIRE ALARM SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

C. The facility shall have an emergency voice alarm communication system. The digitized recorded voice message shall notify occupants that a fire condition has been reported. The message shall instruct the occupants with emergency instructions. Emergency manual voice override shall be provided.

D. The fire alarm manufacturer shall be of the highest caliber and insist on the highest quality. The system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001 ANSI/ASQC Q9001-1994.

E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and shall be in compliance with the UL listing.

G. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.

H. The system shall be an active/interrogative type system where each transponder is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the transponder and its associated initiating device and notification appliance circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.

I. The system shall be arranged such that not less than 20 percent additional transponders may be inserted into any network communication loop.

J. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.2 SCOPE

A. A new intelligent reporting, microprocessor controlled fire detection and emergency voice alarm communication system shall be installed in accordance with the specifications and drawings.

B. Existing fire detection equipment may be reused where the equipment
1. Meets this specification section;
2. Is approved by a recognized national agency (UL,FM, etc.);
3. Is verified as compatible with new equipment being installed;
4. Is verified as operable through testing and inspection;
5. Is approved by the local Authority Having Jurisdiction (AHJ).

C. Basic Performance
1. Alarm and trouble signals from each transponder shall be digitally encoded by listed electronic devices onto an NFPA Style 6 looped multiplex communication system.
2. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto NFPA Style 6 Signaling Line Circuits.
3. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D).
4. Digitized electronic signals shall employ check digits or multiple polling.
5. Transponder devices are to consist of low current, solid-state integrated circuits, and shall be powered from local a primary power and standby battery power source.
6. Power for initiating devices and notification appliances must be from the main fire alarm control panel or the transponder to which they are connected.
7. A single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
8. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
9. Speaker circuits shall be arranged such that there is a minimum of one speaker circuit per smoke zone.
10. Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.
11. Audio amplifiers and tone generating equipment shall be electrically supervised for abnormal conditions. Amplifiers shall be located in transponder cabinets to simplify installation and to reduce power losses in wiring.
12. Speaker circuits shall be 25 VRMS. Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.
13. Speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.
14. Two-way telephone communication circuits shall be arranged so as to allow communication between the fire command center and up to seven (7) remote telephone locations simultaneously.
15. Means shall be provided to connect the telephone circuits to the speaker circuits to allow voice communication over the speaker circuit from a telephone handset.

16. A prerecorded voice module shall be used to store tones and/or messages and transmit them over speaker circuits automatically upon alarm actuation. The voice module shall be all-digital, with no moving parts.

D. Basic System Functional Operation
1. When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur
a) The System Alarm LED shall flash.
b) A local piezo-electric signal in the control panel shall sound.
c) The 80-character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
d) Printing and history storage equipment shall log the information associated with the fire alarm control panel condition, along with the time and date of occurrence.
e) All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
f) The audio portion of the system shall sound the proper signal (tone or voice) to the appropriate zones.

E. The Contractor shall coordinate the requirements of interconnected systems including sprinkler systems, HVAC Fire/Smoke Damper Detectors and HVAC Duct Detectors. The contract drawings may not show all sprinkler waterflow and supervisory switch connections. All waterflow, supervisory switches, HVAC Fire/Smoke Damper Detectors and HVAC Duct Detectors shall be connected to the Fire Alarm System at no additional cost to the owner.

1.3 SUBMITTALS

A. General
1. All substitute equipment proposed as equal to the equipment specified herein, shall meet or exceed the following standards. For equipment other than that specified, the contractor shall supply proof that such substitute equipment does in fact equal or exceed the features, functions, performance, and quality of the specified equipment.
2. Quantity of copies of all submittals shall be submitted to the Architect/Engineer for review as called for in the architectural specifications.

B. Shop Drawings
1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Provide scaled reproducible shop drawings that include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts and wiring requirements. These drawings shall only contain information regarding the Fire Alarm System.
3. Show annunciator layout and main control panel module layout, configurations and terminations.

C. Manuals
1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s) including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation which gives, in detail, the information required to properly operate the equipment and system.
4. Approvals will be based on complete submissions of manuals together with shop drawings.

D. Software Modifications
1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

E. Certifications Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.4 GUARANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid.

1.5 POST CONTRACT MAINTENANCE

A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, test, and repair described below. Include also a quote of unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment and response travel costs. Submittals which do not identify all post contract maintenance costs will not be accepted. The rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

C. Maintenance and testing shall be as required by the local AHJ. A preventive maintenance schedule shall be provided by the contractor which shall describe the plan for preventive

maintenance of all devices and subassemblies requiring regular maintenance. The schedule shall include

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, water flow switches and all accessories of the fire alarm system.
2. Each circuit in the fire alarm system shall be tested semiannually.
3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72, Chapter 7.

1.6 POST CONTRACT EXPANSIONS

A. The contractor shall provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable control modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

C. Quotation shall include installation and test labor and labor to reprogram the system for this 10% expansion. If additional loop interface hardware is required, include the material and labor necessary to install this hardware.

D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent, addressable device. Do not include cost of conventional peripherals or the cost of initiating devices or notification appliances connected to the addressable monitor/control modules.

E. Submittals which do not include this estimate of post contract expansion cost will not be accepted.

1.7 APPLICABLE PUBLICATIONS The publications listed below form a part of this specification. The publications are referenced in text by the basic designation only.

A. National Fire Protection Association (NFPA) - USA
1. No. 70 National Electric Code (NEC)
2. No. 72-1993 National Fire Alarm Code
3. No. 101 Life Safety Code

B. Underwriters Laboratories Inc. (UL) - USA

1.	No. 50	Cabinets and Boxes
2.	No. 268	Smoke Detectors for Fire Protective Signaling Systems
3.	No. 864	Control Units for Fire Protective Signaling Systems
4.	No. 268A	Smoke Detectors for Duct Applications.
5.	No. 521	Heat Detectors for Fire Protective
6.	No. 228	Door Closers-Holders for Fire Protective Signaling Systems.
7.	No. 464	Audible Signaling Appliances.
8.	No. 38	Manually Actuated Signaling Boxes.

9.	No. 346	Waterflow Indicators for Fire Protective Signaling Systems.
10.	No. 1481	Power supplies for Fire Protective Signaling Systems.
11.	No. 1076	Control Units for Burglar Alarm Proprietary Protective Signaling Systems.
12.	No. 1971	Visual Notification Appliances.

C. Local and State Building Codes.

D. All requirements of the Authority Having Jurisdiction (AHJ).

1.8 APPROVALS

A. The system must have proper listing and/or approval from the following nationally recognized agencies

1.	UL	Underwriters Laboratories Inc.
2.	FM	Factory Mutual
3.	ULC	Underwriters Laboratories Canada
4.	MEA	Material Equipment Acceptance (NYC)
5.	CSFM	California State Fire Marshal

B. The Fire Alarm Control Panel and all transponders shall meet the modular labeling requirements of Underwriters Laboratories, Inc. Each subassembly, including all printed circuits, shall include the appropriate UL modular label. Systems which do not include modular labels may require return to the factory for system upgrades, and are not acceptable.
Systems that do not include modular labels are not acceptable and may require return to the factory for upgrades.

PART 2 – PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL

A. All equipment and components shall be new, and the manufacturer’s current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

B. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.

C. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT AND WIRE

A. Conduit
1. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.
2. Where possible, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross-sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.
4. Wiring for 24 volt control, alarm notification, emergency communication, and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4 inch (19.1 mm) minimum.
7. Class A conduit per NFPA 72.

B. Wire
1. All fire alarm system wiring must be new. Existing wiring shall not be reused. All existing wiring shall be removed.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.32 mm) for Notification Appliance circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
5. Wiring used for the multiplex communication loop shall be twisted and shielded and installed in conduit unless specifically excepted by the fire alarm equipment manufacturer.
6. All field wiring shall be completely supervised.
7. All voice speaker and telephone circuits shall use twisted/shielded pair to eliminate crosstalk.

C. Terminal Boxes, Junction Boxes and Cabinets All boxes and cabinets shall be UL listed for their intended purpose.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. The main fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution

Panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold-water pipe or grounding rod.

2.3 MAIN FIRE ALARM CONTROL PANEL [AND FIRE COMMAND CENTER]

A. The main FACP Central Console shall be a NOTIFIER Model AM2020 and shall contain a microprocessor based central processing unit (CPU). The FACP shall communicate with and control the following types of equipment used to make up the system intelligent detectors, addressable modules, transponders, local and remote operator terminals, printers, annunciators, emergency voice communication systems and other system-controlled devices.

B. The main FACP [and Central Console] shall perform the following functions
1. Supervise and monitor all intelligent/addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to transponders.
3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.
4. Visually and audibly annunciate any trouble, supervisory or alarm, condition on operator's terminal, panel display, and annunciators.

C. System Capacity and General Operation
1. The control panel shall provide, or be capable of expansion to, 198 intelligent/addressable devices per loop plus 2048 annunciation points per system.
2. The fire alarm control panel shall include a full featured operator interface control and annunciation panel which shall include a Bake lite Liquid Crystal Display (LCD), individual, color coded system status LEDs, and an alpha-numeric keypad for field programming and control of the fire alarm system.
3. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.
4. The system shall include emergency voice communications utilizing distributed amplification and intelligence such that loss of operation by the main FACP will not result in the loss of evacuation signal throughout the balance of the building.
5. The FACP shall provide the following features

a)	Block Acknowledge	Printer Interface
b)	Charger rate Control	CRT Display Interface
c)	Control-by-Time	Non-Alarm Module Reporting
d)	Day/Night Sensitivity	Periodic Detector Test
e)	Device Blink Control	Remote Page
f)	Drift Compensation	Trouble Reminder
g)	NFPA 72, Sensitivity Test	Upload/Download to PC computer
h)	System Status Reports	Verification Counters
i)	Security Monitor Points	Walk Test
j)	Alarm Verification	Maintenance Alert

D. Central Processing Unit (CPU)
1. The Central Processing Unit shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the central processing unit.
2. The CPU shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
3. The Central Processing Unit shall also provide a real-time clock for time annotation of all system displays. The Time-Of-Day and date shall not be lost if system primary and secondary power supplies fail.

E. Display
1. The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
3. The system display shall provide an 80-character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide 5 light-emitting-diodes (LEDs), which will indicate the status of the following system parameters AC POWER, SYSTEM ALARM; SYSTEM TROUBLE, DISPLAY TROUBLE, and SIGNAL SILENCE.
4. The system display shall provide a 25-key touch keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels will be accessible through the display interface assembly to prevent unauthorized system control or programming.
5. The system display shall include the following operator control switches SIGNAL SILENCE, LAMP TEST, RESET, SYSTEM TEST, and ACKNOWLEDGE

F. Loop Interface Board (LIB)
1. Loop Interface Boards shall be provided to monitor and control each of the Signaling Line Circuit (SLC) Loops in the system. The loop interface board shall contain its own microprocessor and shall be capable of operating in local mode in the case of a failure in the main CPU of the control panel. In local mode, the loop interface board shall detect alarms and activate output devices on its own SLC loop.
2. The LIB shall not require any jumper cuts or address switch settings to initialize SLC Loop operations.
3. The Loop Interface Board shall provide power to, and communicate with, all of the intelligent detectors and addressable Modules connected to its SLC Loop over a single pair of wires. This SLC Loop shall be capable of operation as NFPA Style 7.
4. The LIB shall be able to drive two Style 7 runs of these SLC Loops, each up to 10,000 feet in length.
5. The Loop Interface Board shall receive analog information from all intelligent detectors and shall process this information to determine whether normal, alarm,

or trouble conditions exist for that particular detector. The loop interface board software shall include software to automatically adjust and compensate for dust accumulation to maintain detector performance as it is affected by environmental factors. The analog information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

6. The LIB shall communicate with each Intelligent Addressable Detector and addressable module on its SLC loop and verify proper device function and status. Communication with up to 198 intelligent devices shall be performed every 6 seconds or less.

G. Serial Interface Board (SIB)
   1. The Serial Interface Board shall provide the EIA-232 interface between the fire alarm control panel and UL-Listed Electronic Data Processing (EDP) peripherals.
   2. The SIB shall allow the use of multiple printers, CRT monitors, and other peripherals connected to the EIA-232 ports.
   3. The Serial Interface Board shall provide one EIA-485 port for the serial connection of the optional annunciator and control subsystem components.
   4. The SIB shall include LEDs which indicate that it is in regular communication with the annunciators and other EIA-485 connected peripheral devices.
   5. All EIA-232 circuits shall be optically isolated and power limited.

H. Enclosures
   1. The control panels shall be housed in UL listed cabinets suitable for surface or semi-flush mounting. Cabinets shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
   2. The back box and door shall be constructed of .060 steel with provisions for electrical conduit connections into the sides and top.
   3. The door shall provide a key lock and include a transparent opening for viewing all indicators. For convenience, the door shall have the ability to be hinged on either the right or left-hand side.
   4. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.

I. The main FACP central console shall be designed so as to permit continued local operation of remote transponders under both normal and abnormal network communication loop conditions. This shall be obtained by having transponders operate as local control panels upon loss of network communication.

J. The FACP and CPU shall be modular in construction to allow ease of servicing. The CPU and transponders shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems which require use of external programmers or change of EPROMs are not acceptable.

K. The CPU and associated equipment are to be protected so that they will not be affected by voltage surges or line transients including RFI and EMI.

L. Each transponder and peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU, transponders, and peripheral devices shall be reliable and error free. The transmission scheme used should employ dual transmission or other equivalent error checking techniques. Failure of any

transponder or peripheral device to respond to an interrogation shall be annunciated as a trouble condition.

M. Voice Command Center (VCC)
1. The Voice Command Center (VCC), located with the FACP, shall contain all equipment required for all audio control, telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control telephone circuit indication and control, digital voice units, microphone and main telephone handset.
   a) Function. The Voice Command Center equipment shall perform the following functions:
      1) Operate as a supervised single channel emergency voice communication system.
      2) Operate as a two-way emergency telephone system control center.
      3) Audibly and visually annunciate the active or trouble condition of every speaker circuit and telephone circuit.
      4) Audibly and visually annunciate any trouble condition of tone generators and digital voice units required for normal operation of the system.
      5) Provide all-call activities through activation of a single control switch.
      6) Provide automatic, digitally-recorded voice messages and tones which may be field-programmed through the microphone.
   b) The VCC shall be modular in construction. The VCC shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment. Equipment shall be an integral part of the FACP. Stand alone voice evacuation panels will not be accepted.
   c) The VCC and associated equipment shall be protected against unusually high voltage surges or line transients.

N. Power Supply
1. The main power supply shall operate on 120 VAC, 60Hz, and shall provide all necessary power for the FACP.
2. It shall provide 3.0 amps of usable notification appliance power, using a switching 24 VDC regulator.
3. It shall be expandable for additional notification appliance power in 3.0 ampere steps.
4. It shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. It shall charge 55 Amp Hour batteries with-in a 48 hour period.
5. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults on sensitive addressable modules.
6. It shall be power-limited per 1995 UL864 requirements.
7. It shall provide meters to indicate battery voltage and charging current.

O. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.

1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The connection between the UDACT and the control panel shall be completely supervised.
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA requirements. It shall include the ability for split reporting of panel events.
3. The UDACT shall be completely field programmable from a built-in keypad and 4 character red, seven segment display.
4. The UDACT shall be capable of transmitting events in at least 9 different formats. This ensures compatibility with existing and future transmission formats. Accepted formats include
   a) 3+1 Standard - 4+1 Standard
   b) Ademco Contact ID - 4+1 and 4+2 Ademco
5. Communication shall include vital system status such as
   a) Independent Zone (Alarm, trouble, non-alarm)
   b) Independent Zone Supervisory Signal
   c) AC (Mains) Power Loss
   d) Low Battery and Earth Fault
   e) System Off Normal
   f) 12 and 24 Hour Test Signal
   g) Abnormal Test Signal (per UL requirements)
   h) EIA-485 Communications Failure
6. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.

P. Field Charging Power Supply The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.
2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Z or Y) shall be available for connection to the Notification devices.
3. The FCPS shall include an attractive surface mount backbox.
4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per 1993 NFPA requirements.
5. The FCPS include power limited circuitry, per 1995 UL standards.

Q. System Circuit Supervision
1. The FACP shall supervise all circuits to intelligent devices, transponders, annunciators and peripheral equipment and annunciate loss of communications with these devices. The CPU shall continuously scan above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate which device or devices are not responding and print the information on the printer.

2. Transponders that lose communication with the CPU shall sound an audible trouble and light an LED indicating loss of communications.
3. Transponder Circuit Supervision Transponders shall be designed such that they continuously scan all of their initiating and notification circuits. With normal communications between the FACP and the transponders, the transponders shall transmit initiating and notification circuit trouble conditions to the FACP for audible annunciation and printout. With or without communication with the FACP, the transponders shall supervise their circuits and annunciate any initiating circuit and notification circuit failures on LEDs located on the transponder.
4. Sprinkler system valves, standpipe control valves, PIV, and main gate valves shall be supervised for off-normal position.
5. All speaker and emergency phone circuits shall be supervised for opens and shorts. Each transponder speaker and emergency phone circuit shall have an individual ON/OFF indication (green LED).

R. Field Wiring Terminal Blocks

For ease of service, all wiring terminal blocks shall be the plug-in type and have sufficient capacity for 18 to 12 AWG wire. Fixed terminal blocks are not acceptable.

S. Audio Amplifiers

1. The Audio Amplifiers will provide Audio Power (@25 Volts RMS) for distribution to speaker circuits.
2. Multiple audio amplifiers may be mounted in the transponder or in the main fire alarm control panel, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).
3. The audio amplifier shall include an integral power supply, and shall provide the following controls and indicators
   a) Normal Audio Level LED
   b) Incorrect Audio Level LED
   c) Brownout LED
   d) Battery Trouble LED
   e) Amplifier Trouble LED
   f) Audio Amplifier Gain Adjust
4. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
5. Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).
6. Amplifier shall be backed up in groups (1 amplifier backs up several). Failure of any one amplifier in the system shall not degrade system performance in any way.

T. Audio Message Generator (Prerecorded Voice)/Speaker Control

1. Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.
2. Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times.
3. A built-in microphone shall be provided to allow paging through speaker circuits.
4. The message generator shall provide a system paging capability from telephone circuits.

5. The audio message generator shall have the following controls and indicators to allow for proper operator understanding and control
   All Call LED
   On-Line LED
   All Call Switch
   Local Speaker Volume Control
   Local (Test) Speaker
6. The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.
7. The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.

U. Emergency Two-Way Telephone Control Switches/Indicators
1. The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.
2. The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

V. Operators Terminal
Provide the following functions in addition to any other functions required for the system.
1. Acknowledge (ACK/STEP) Switch
   a) Activation of the control panel Acknowledge switch in response to a single new Alarm and/or trouble condition shall silence the local panel piezo electric signal and change the system alarm or trouble LED from flashing mode to steady-ON mode. If additional new Alarm or Trouble conditions exist or are detected and reported in the system, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
   b) Depressing the acknowledge switch shall also silence all remote annunciator piezo sounders.
2. Signal Silence Switch
   a) Activation of the signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm activation. The selection of notification circuits and relays which are silenceable by this switch shall be fully field programmable within the confines of all applicable standards.
3. System Reset Switch
   a) Activation of the system reset switch shall cause all electronically latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
   b) If an alarm condition(s) still exists, or if they reoccur in the system after system reset switch activation, the system shall then resound the alarm conditions.
4. System Test Switch.
   a) Activation of the system test switch shall initiate an automatic test of all Intelligent/Addressable detectors in the system. The system test shall activate the electronics in each intelligent sensor, simulating an alarm condition and causing the transmission of the alarm condition from that sensor to the fire alarm control panel. The fire alarm control panel shall interpret the data from each sensor installed in the system. A report

summarizing the results of this test shall be displayed automatically on the system LCD, and on any CRTs or printers in the system.

5. Lamp Test Switch
   a) Activation of the lamp test switch shall sequentially turn on all LED indicators, system liquid crystal display and local piezo signal, and then automatically return the fire alarm control panel to the previous condition.

W. Video Display Terminal
1. The Video Display Terminal shall provide a visual display and an audible alert of all changes in status of the system and shall annotate such displays with the current time-of-day and date.
2. The Video Display Terminal shall be enclosed in a cabinet suitable for placement on a desktop or table.
3. A detachable keyboard shall be provided that may be used for programming, testing, and control of the system. Individual keys shall be provided on the keyboard for the ACKNOWLEDGE, RESET, LAMP TEST, SYSTEM TEST, and SIGNAL SILENCE functions of the control panel.
4. The video display terminal shall include a count of all alarms and troubles in the system, as well as a count of all alarms and trouble requiring acknowledgment. These counts shall be continuously displayed during all FACP operations.
5. The video display terminal shall meet Swedish magnetic emission and X-radiation guidelines MPR 199010.

X. Printer
1. Printers shall be of the automatic type, printing code, time, date, location, category, and condition.
2. The printer shall provide hard-copy printout of all changes in status of the system and shall timestamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table. The printer shall communicate with the control using an interface complying with Electrical Industries Association standard EIA-232D. The printer power shall be 120 VAC @ 60 Hz.
3. Thermal printers are not acceptable.
4. The system shall have an optional strip printer capable of being mounted directly in the system enclosure. Alarms shall be printed in easy to read RED, other messages, such as troubles, shall be printed in black. This printer shall receive power from the system power supply and shall operate via battery back-up in the unlikely event that AC mains are lost. The strip printer shall be UL-864 listed.

Y. Transponders (Remotely Located Control Panels)
1. Transponders shall be listed under UL category UOJZ as an independent, local fire alarm control unit as well as being listed as a critical component in a multiplex fire alarm system. Transponders shall be located where shown on the plans.
   The transponder shall serve as the interface between initiating fire devices, controlled signaling devices, and the CPU. The supervised multiplex communication port shall be an integral part of the transponder.
2. Each Transponder shall be powered from a local Power Supply and shall provide all power necessary for its own operation, including standby power.

3. Transponders shall communicate with, and be controlled by, the host Fire Alarm Control Panel via a 2-wire SLC Loop. This SLC Loop shall operate as a NFPA Style 4, Style 6 or a Style 7 Loop.
4. Transponders shall be used to house amplifiers, batteries and power supplies to allow a true distributed processing and amplification.
5. Each transponder shall have the following indicators and operator Controls
   a) Alarm Acknowledge/Reset Switch
   b) Power LED
   c) System alarm LED
   d) System trouble LED
   e) Local piezoelectric signal
   f) Red alarm per Initiating Device Circuit
   g) Green on/off LED per notification appliance circuit or relay
6. Each transponder will be capable of expansion of up to 24 field circuits of the following types in any mix

Z. Initiating Device Circuits (IDC) IDCs may be added to the Transponder in groups of 8 Style B (Class B), or 4 Style D (Class A) circuits. Each circuit shall be capable of monitoring up to 30 compatible 2-wire smoke detectors, and/or any number of contact type initiating devices.

AA. Fire Fighter's Telephone Circuits Firefighter's telephone circuits may be added to the transponder in groups of 8 circuits.

BB. Fire alarm speaker circuits Fire alarm speaker circuits may be added to the transponder in groups of 8 circuits. Each circuit shall be capable of supervising the field circuit, and of transmitting up to 30 Watts of audio power.

CC. Auxiliary Control Relay Outputs Auxiliary relay outputs may be added to the transponder in groups of eight individually controlled single Form-C circuits, or four dual Form-C circuits. All Auxiliary circuits shall be rated 2 A. @ 30 VDC.

DD. Field Programming
1. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
2. All programming shall be accomplished through the standard FACP keyboard or through the video display terminal.
3. All field defined programs shall be stored in non-volatile memory.
4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.

EE. Specific System Operations
1. Smoke Detector Sensitivity Adjust Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the system keypad or from the keyboard of the video terminal. Sensitivity range shall be within the allowed UL window.

2. Alarm Verification Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The FACP shall keep a count of the number of times each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
3. System Point Operations
   a) Any device in the system may be enabled or disabled through the system keypad or video terminal.
   b) Any system output point may be turned on, or off, from the system keypad or the video terminal.
4. Point Read The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point will be annunciated for the parameters listed
   a) Device Status.
   b) Device Type.
   c) Custom Device Label.
   d) Software Zone Label.
   e) Device Zone Assignments.
   f) Detector Analog Value.
   g) All Program Parameters.
5. System Status Reports Upon command from a password-authorized operator of the system, a status report will be generated, and printed, listing all system status.
6. System History Recording and Reporting The fire alarm control panel shall contain a History Buffer that shall be capable of storing up to 400 system output/input/control activations. Each activation will be stored, and time and date stamped with the actual time of the activation, until an operator requests that the contents be either displayed or printed. The contents of the History Buffer may be manually reviewed, one event at a time, and the actual number of activations may also be displayed and or printed.
7. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
8. Automatic Detector Maintenance Alert The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
9. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the Trouble Mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

2.4 SYSTEM COMPONENTS

A. Speakers
   1. Shall operate on 25 VRMS with field selectable output taps from 0.5 to 2.0 W.
   2. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3 m).
   3. Frequency response shall be a minimum of 400 Hz to 4000 Hz.

B. Strobe Lights shall be combination strobe-mini sounder units.
   1. Shall operate on 24 VDC nominal.

2. Shall meet the requirements of the ADA as defined in UL standard 1971 and shall meet the following criteria
   a) The maximum pulse per UL 1971.
   b) Candela intensity shall meet the requirements of UL 1971.
   c) The flash rate shall meet the requirements of UL 1971.
   d) The appliance shall be placed 80 in (2,030 mm) above the highest floor level within the space, or 6 in (152 mm) below the ceiling, whichever is lower.
   e) Where two or more strobes may be viewed those strobes shall be synchronized.
   f) The design intent with the strobe and strobe/horn units is to meet ADA and NFPA requirements regarding unit candela rating. The contractor shall provide the corresponding strobe in the respective areas. The intent of this requirement is to minimize power supplies. Contractor shall show these candela ratings on shop drawings.

C. Audible/Visual Combination Devices
1. Shall meet the applicable requirements of Section A listed above for audibility.
2. Shall meet the requirements of Section B listed above for visibility.

D. Addressable Devices - General
1. Addressable devices shall provide an address-setting means using rotary decimal switches.
2. Addressable devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches. Devices which use a binary address setting method, such as a dip switch, which are difficult to install and subject to installation error. This type of device is not an allowable substitute.
3. Detectors shall be Intelligent and Addressable and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual (2) alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.
5. Smoke detector sensitivity shall be set through the Fire Alarm Control Panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature. An optional base shall be available with a built-in (local) sounder rated at 85 DBA minimum.
8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

E. Addressable Pull Box (manual station)
1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall be double-action and shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual stations shall be double action and constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
4. Stations shall be suitable for surface mounting or semi flush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.

F. Intelligent Photoelectric Smoke Detector
1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

G. Intelligent Ionization Smoke Detector
1. The detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

H. Intelligent Thermal Detectors
1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit. Up to 99 intelligent heat detectors may connect to one SLC loop.

I. Intelligent Duct Smoke Detector
1. The in-duct smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.
3. Fire alarm addressable duct detectors and fire alarm addressable relays for fan shutdown shown on the HVAC equipment will be addressed as follows:
    a) Duct detectors shall be provided by the division 16 contractor and installed by the division 15 contractor. Fan shutdown relay shall be provided and installed by the division 16 contractor. Division 15 controls contractor shall connect the relay for fan shutdown. The division 16 special systems contractor shall monitor both devices.

J. Addressable Dry Contact Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops.
2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.
3. The IDC zone may be wired for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.

K. Two Wire Detector Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.
3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

L. Addressable Control Module
1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The control module NAC may be wired for Style Z or Style Y (Class A) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.
5. The control module shall be suitable for pilot duty applications and rated for a minimum of .6 amps at 30 VDC.

M. Isolator Module
1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

N. LCD Alphanumeric Display Annunciator
1. The alphanumeric display annunciator shall be a supervised, locally or remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
2. The LCD annunciator shall display all alarm and trouble conditions in the system.
3. Up to 32 LCD annunciators may be connected to a specific (terminal mode) EIA 485 interface. LCD annunciators shall not reduce the annunciation capacity of the system. Each LCD shall include vital system wide functions such as, System Acknowledge, Silence and Reset.
4. LCD display annunciators shall mimic the main control panel 80-character display and shall not require special programming.

O. Portable Emergency Telephone Handset Jack
1. Portable emergency telephone handset jacks shall be flush mounted on stainless steel plates as indicated on plans. Handset jacks shall be approved for emergency telephone system application.
2. Insertion of a remote handset plug into a jack shall send a signal to the fire command center which shall audibly and visually indicate the on-line condition, and shall sound a ring indication in the handset.
3. The two-way emergency telephone system shall support a minimum of seven (7) handsets online without degradation of the signal.

P. Fixed Emergency Telephone Handset
1. The telephone cabinet shall be painted red and clearly labeled emergency telephone. The cabinets shall be located where shown on drawings.
2. The handset cradle shall have a switch connection such that lifting the handset off of the cradle shall send a signal to the fire command center which shall audibly and visually indicate its on-line (off-hook) condition.
3. The two-way emergency telephone system shall support a maximum of seven (7) handsets online (off hook) without degradation of the signal.

2.5 BATTERIES AND EXTERNAL CHARGER

A. Battery
1. Shall be 12 volt, Gel-Cell type.
2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

B. External Battery Charger
   1. Shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120-volt 60 hertz source.
   2. Shall be rated for fully charging a completely discharged battery within 48 hours while simultaneously supplying any loads connected to the battery.
   3. Shall have protection to prevent discharge through the charger.
   4. Shall have protection for overloads and short circuits on both AC and DC sides.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC, NFPA72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. All conduit, junction boxes, conduit supports, and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

3.2 TYPICAL OPERATION

A. Actuation of any manual station, smoke detector, heat detector or water flow switch shall cause the following operations to occur unless otherwise specified
   1. Activate all programmed speaker circuits.
   2. Actuate strobe units until the panel is reset.
   3. Light the associated indicators corresponding to active speaker circuits.
   4. Release all magnetic door holders to doors to adjacent zones on the floor from which the alarm was initiated.
   5. Return all elevators to the primary or alternate floor of egress.
   6. A smoke detector in any elevator lobby shall, in addition to the above functions, return all elevators to the primary or alternate floor of egress.
   7. Smoke detectors in the elevator machine room or top of hoistway shall return all elevators in to the primary or alternate floor. Smoke detectors or heat detectors installed to shut down elevator power shall do so in accordance with ANSI A17.1 requirements and be coordinated with the electrical contractor.
   8. Duct type smoke detectors shall, in addition to the above functions, shut down the ventilation system or close associated control dampers as appropriate.
   9. Activation of any sprinkler system low pressure switch, on valve tamper switch, shall cause a system supervisory alarm indication.

B. Auxiliary Control System Normal Operation
   1. "On/Auto/Off" switches and status indicators shall be provided for monitoring and manual control of fans, dampers, door unlocking, door holder release, HVAC Control Units, Elevator Status, Stairwell Pressurization or Smoke Exhaust Fans.

2. Manual "Off" indication shall be red. "On" indication shall be green. In all modes, the "on" and "off" indications shall continuously follow the device status. Manual selection of "on" shall force the controlled relay to the "on" state until manually returned to "automatic" state. Manual selection of "off" shall force the controlled relay to the "off" state until manually returned to "automatic." All HVAC system controls (i.e., limit switches, vane switches, etc.) to be provided by the HVAC contractor.
3. Positive feedback shall be employed to verify correct operation of the device being controlled. Systems that indicate on/off/auto by physical switch position only are not acceptable.
4. A single yellow trouble LED shall be provided with each switch to indicate a trouble in the monitor and control point(s) associated with that switch.

3.3 TEST

A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.
1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all flow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open signaling line circuits and verify that the trouble signal actuates.
6. Open and short notification appliance circuits and verify that trouble signal actuates.
7. Ground initiating device circuits and verify response of trouble signals.
8. Ground signaling line circuits and verify response of trouble signals.
9. Ground notification appliance circuits and verify response of trouble signals.
10. Check alert tone and prerecorded voice message to all alarm notification devices.
11. Check installation, supervision, and operation of all intelligent smoke detectors using walk test.
12. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
13. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.4 FINAL INSPECTION

A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.5 INSTRUCTION

A. Provide instruction as required for operating the system. "Hands-on" demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer’s representatives shall provide a typewritten "Sequence of Operation" to the Owner.

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 31 2000

EARTHWORK

PART 1 - GENERAL

1.1. WORK INCLUDED

A. The work covered by this Section consists of furnishing all plant, labor, equipment, appurtenances and material in performing all operations, hauling, placing, spreading, watering, processing, compacting and shaping earth sections complete in place in accordance with the Project Manual and Drawings.

1.2. RELATED WORK ELSEWHERE

A. Section 31 2001 – Excavation, Trenching, Fill and Backfill.

B. General foundation notes on Drawings. In case of conflict or omission, the general foundation notes shall govern.

1.3. SUBSURFACE SOIL DATA

A. Subsurface soil investigations have been made and the results are available for examination by the Contractor. This is not a warranty of conditions, the Contractor is expected to examine the site and determine for himself the character of materials to be encountered.

B. No additional allowance will be made for rock removal, site clearing and grading, filling, compaction, disposal, or removal of any unclassified materials.

1.4. REFERENCES

A. American Society for Testing and Materials (ASTM).

1. ASTM D 1556-90 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
2. ASTM D 1557-91 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3).
3. ASTM D 2922-96 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
4. ASTM D 3017-96 Standard Test Method for Water content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
5. ASTM D 4318-95a Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.5. SUBMITTALS

A. Submit copies of materials certificates and test results for materials in accordance with type of tests, frequencies and remarks as outlined in the sampling and testing schedule.

1.6. TESTING AND INSPECTION

A. General: The Contractor shall employ the services of a registered, licensed Geotechnical Engineer to observe all controlled earthwork soil testing. The testing laboratory shall provide continuous on-site observation by experienced personnel during construction of fill material. The Contractor shall notify the testing laboratory at least two working days in advance of any field operations of controlled earthwork, or of any resumption of operations after stoppages.

B. Report of Field Density Tests

1. The Geotechnical Engineer shall submit, daily, the results of field density tests required by these specifications.

C. Costs of Tests and Inspection

1. The cost of testing, inspecting and engineering, as specified in this section of the specifications, shall be borne by the Contractor.

D. Lines and Grades: Alignment and grade of all elements shall be made on true tangents and curves. Grades shall conform to the elevations indicated on Drawings, with minor adjustments, to provide a smooth approach at building lines, at connections to existing paving and to provide proper drainage. Correct irregularities at no cost to the Owner.

1.7. WEATHER LIMITATIONS

A. Controlled fill shall not be constructed when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees, it shall be the responsibility of the Contractor to protect all areas of completed work against any detrimental effects of ground freezing by methods approved by the testing laboratory. Any areas that are damaged by freezing shall be reconditioned, reshaped, and compacted by the Contractor in conformance with the requirements of this specification without additional cost to the Owner.

PART 2 - PRODUCTS

2.1. NON - STRUCTURAL FILL MATERIAL

A. The material shall be clean, free of roots, organic matter, trash, debris, lumps or stones larger than 6 inches.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

2.2. STRUCTURAL FILL MATERIAL

A. Material shall consist of soils that conform to the following physical characteristics:

Sieve Size Sq. Openings	Percent Passing By Weight
6 inch	100
4 inch	85 – 100
¾ inch	70 - 100
No. 4	50 - 100
No. 200	40 (max)

B. Maximum expansive potential (%)……1.5

C. Maximum soluble sulfates (%)……..0.10

PART 3 - EXECUTION

3.1. PREPARATION

A. Clearing and Grubbing: Prior to placing structural fill all borrow areas and areas to receive structural fill shall be stripped of vegetation and deleterious materials. Strippings shall be hauled offsite or stockpiled for subsequent use in landscaped areas or non-structural fill areas as designated by the Owner or his representative and approved by the Geotechnical Engineer.

3.2. CONSTRUCTION AREA TREATMENT

A. Site Preparation - Fill Areas: Prior to placing structural fill the areas to be filled shall be scarified to a depth of eight inches and moisture conditioned as described below. The area to be filled shall then be compacted to a minimum of 95 percent of maximum density as determined in accordance with ASTM D 1557. Any soft or "spongy" areas shall be removed as directed by the Geotechnical Engineer and replaced with structural fill as described herein.

B. Site Preparation - Cut Areas: Following excavation to rough grade all building and pavement areas shall be scarified to a depth of eight inches and moisture conditioned as described below. All building and paved areas shall be compacted to a minimum of 95 percent of maximum density as determined by ASTM D 1557.

3.3. EQUIPMENT AND METHODS

A. In areas not accessible to heavy equipment, distribute by and compact with hand operated vibratory compactors.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.4. BORROW

A. The Contractor shall provide sufficient material for fill to the lines, elevations and cross sections as shown on the contract drawings from borrow areas.

B. The Contractor shall obtain from the Owners of said borrow areas the right to excavate material, shall pay all royalties and other charges involved, and shall pay all expenses in developing the source including the cost of right-of-way required for hauling the material.

3.5. COMPACTION

A. Fill shall be spread in layers not exceeding 8 inches, watered as necessary, and compacted. Moisture content at time of compaction shall be 3 percent below optimum moisture or higher. A density of not less than 95 percent of maximum dry density within the building pads and paved areas shall be obtained. Fill areas outside the building pads and paved areas shall be compacted to 95 percent of maximum dry density.

B. Optimum moisture content and maximum dry density for each soil type used shall be determined in accordance with ASTM D 1557.

C. Compaction of the fill shall be by mechanical means only. Where vibratory compaction equipment is used, it shall be the Contractor's responsibility to ensure that the vibrations do not damage nearby buildings or other adjacent property. Where vibratory compaction is not possible, pneumatic rolling equipment shall be used.

MATERIAL	MINIMUM PERCENT COMPACTION
Structural & granular fill in construction area	95
Subgrade below structural fill	95
Structural fill under exterior walls	95
Subgrade under asphalt & sidewalks	95
Miscellaneous backfill	90

3.6. MOISTURE CONTROL

A. The material, while being compacted, shall be within the moisture range of 3% below to 3% above optimum, well distributed throughout the layer.

3.7. DENSITY REQUIREMENTS

A. Density of undisturbed soils, in-place fill and backfill shall be determined in accordance with the procedures of ASTM D 1556 or ASTM D 2922 and D 3017. If tests indicate that the density of in-place soil is less than required, the material shall be scarified, moistened or dried as necessary to obtain proper moisture content and recompacted as necessary to achieve the proper densities. Sufficient density tests shall be made and reports submitted

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

by the Testing Laboratory indicating all cut and fill areas were compacted and graded in accordance with the requirements.

3.8. SLOPE PROTECTION & DRAINAGE

A. Berming and grading shall be done as may be necessary to prevent surface water from flowing into and out of the construction area. Any water accumulating therein shall be removed by pumping or by other methods.

3.9. SOIL EROSION PROTECTION

A. The Contractor shall ensure that no soil erodes or blows from the site into public right-of-way or onto private property.

B. The Contractor shall promptly clean up any material which erodes or blows into the public right-of-way or onto private property.

3.10. PRESERVATION OF PROPERTY

A. Provide temporary fences, barricades, coverings, or other protections to preserve existing items indicated to remain and to prevent injury or damage to persons or property. Apply protections to adjacent properties as required.

B. Restore damaged work to condition existing prior to start of work, unless otherwise directed.

3.11. EXISTING UTILITIES

A. The Contractor shall verify the location of any utility lines, pipelines, or underground utility lines in or near the area of the work in advance of and during Earthwork. The Contractor is fully responsible for any and all damage caused by failure to locate, identify and preserve any and all existing utilities, pipelines and underground utility lines. Repair damaged utilities to the satisfaction of the utility owner at no expense to the Owner.

B. Should uncharted or incorrectly charted piping or other utilities be encountered during grading, consult the Architect immediately for directions as to procedures.

C. Cooperate with the Owner and public or private utility companies in keeping service and facilities in operation.

3.12. WASTE

A. Dispose of all waste off Owner's property.

B. Burning of waste will not be permitted.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

3.13. AIR POLLUTION

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt air pollution. Comply with governing regulations pertaining to environmental protection.

SAMPLING AND TESTING SCHEDULE
FOR EARTHWORK

FIELD QUALITY CONTROL

MATERIAL	TEST FOR	FREQUENCY	REMARKS
NATURAL GROUND	Compaction in accordance with ASTM D 1556 or ASTM D 2922 and D 3017	1 per 500 square yards of surface	Conduct a minimum of 2 tests on each section.
EMBANKMENT AND/OR SUBGRADE	Soil Conditions Moisture-Density in Accordance with ASTM D 1557	Test 1 per soil Classification	
	Compaction control in accordance with ASTM D 1556 or ASTM D 3017	1 per each lift every 300 square yards of surface 1 per each lift for each 100 cubic yards of fill	1) Immediately after placing 2) Conduct a minimum of 2 tests per section

END OF SECTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 31 1000 SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01 1000 - Summary: Sequencing and staging requirements.

D. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

E. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

F. Section 31 2200 - Grading: Topsoil removal.

G. Section 31 2200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

H. Section 31 2323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

I. Section 31 2323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.03 QUALITY ASSURANCE

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

PART 2 PRODUCTS

2.01 MATERIALS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

A. Fill Material: As specified in Section 31 2200 - Grading

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01 7000.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not begin clearing until vegetation to be relocated has been removed.

C. Do not remove or damage vegetation beyond the following limits:

1. 40 feet outside the building perimeter.
2. 10 feet each side of surface walkways, patios, surface parking, and utility lines less than 12 inches in diameter.
3. 15 feet each side of roadway curbs and main utility trenches.
4. 25 feet outside perimeter of pervious paving areas that must not be compacted by construction traffic.
5. Exception: Specific trees and vegetation indicated on drawings to be removed.
6. Exception: Selective thinning of undergrowth specified elsewhere.

D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:

1. At vegetation removal limits.
2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
3. Around other vegetation to remain within vegetation removal limits.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.

1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

G. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

H. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 31 1000

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 31 2316.13 TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Section 31 2200 - Grading: Site grading.

C. Section 31 2316 - Excavation: Building and foundation excavating.

D. Section 31 2323 - Fill: Backfilling at building and foundations.

1.03 REFERENCES

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010.

C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

L. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated by architect and/or construction manager.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove excavated material that is unsuitable for re-use from site.

G. Remove excess excavated material from site.

3.03 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.04 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.

1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:

H. Reshape and re-compact fills subjected to vehicular traffic.

3.05 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

3.06 FIELD QUALITY CONTROL

A. Perform compaction testing in accordance with recommendations contained in the geotechnical report.

B. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

E. If tests indicate work does not meet specified requirements, remove work, replace and retest.

END OF SECTION 31 2316.13

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 31 2316.26 ROCK REMOVAL

PART 3 EXECUTION

1.01 ROCK REMOVAL

A. Form level bearing at bottom of excavations.

B. Remove shaled layers to provide sound and unshattered base for footings.

C. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

D. Remove excavated materials from site.

E. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 2323.

END OF SECTION 31 2316.26

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 31 2316 EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Section 31 2200 - Grading: Soil removal from surface of site.

C. Section 31 2200 - Grading: Grading.

D. Section 31 2323 - Fill: Fill materials, filling, and compacting.

1.03 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Protect plants, lawns, rock outcroppings, and other features to remain.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

3.02 EXCAVATING

A. Underpin adjacent structures that could be damaged by excavating work.

B. Excavate to accommodate new structures and construction operations.

C. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

D. Preparation for Piling Work: Excavate to working elevations. Coordinate special requirements for piling.

E. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

F. Do not interfere with 45 degree bearing splay of foundations.

G. Cut utility trenches wide enough to allow inspection of installed utilities.

H. Hand trim excavations. Remove loose matter.

I. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

J. Grade top perimeter of excavation to prevent surface water from draining into excavation.

K. Remove excavated material that is unsuitable for re-use from site.

L. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.

M. Remove excess excavated material from site.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.04 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION 31 2316

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 31 2323 FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the Geotechnical Report.

B. Section 31 2200 - Grading: Removal and handling of soil to be re-used.

C. Section 31 2200 - Grading: Site grading.

D. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

E. Section 31 3700 - Riprap.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the Geotechnical Report.

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010.

C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

L. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Perform all work in accordance with the Geotechnical Report.

B. Concrete for Fill: Lean concrete.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

C. Topsoil: See Section 31 2200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

D. Verify structural ability of unsupported walls to support imposed loads by the fill.

E. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

3.02 PREPARATION

A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

G. Correct areas that are over-excavated.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1. Load-bearing foundation surfaces: Fill with concrete.
2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

H. Compaction Density Unless Otherwise Specified or Indicated:

I. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated. See section 31-2300 Excavation, Backfill & Compaction for Structures.

3.05 FIELD QUALITY CONTROL

A. Perform compaction testing in accordance with recommendations contained in the geotechnical report.

B. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

E. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.06 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 31 2323

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 31 3700 RIPRAP

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Riprap.

1.2 RELATED REQUIREMENTS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Section 31 2323 - Fill: Aggregate requirements.

1.3 QUALITY ASSURANCE

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 MATERIALS

A. Riprap: Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Aggregate: Granular fill as specified in Section 31 2323.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not place riprap bags over frozen or spongy subgrade surfaces.

3.2 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap at culvert pipe ends, embankment slopes, and at locations specified in

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

plans.

C. Place into position. Knead, ram, or pack filled bags to conform to contour of adjacent material and other bags previously placed.

D. Reference sheet C-501 for shape and dimensions. Reference sheet C-505 for required thickness.

E. Place rock evenly and carefully over bagged riprap to minimize voids, do not tear bag fabric, place bags and rock in one consistent operation to preclude disturbance or displacement of substrate.

F. After placement, spray with water to moisten the bagged mix. Maintain moist for 24 hours.

3.3 SCHEDULES

A. Culvert Pipe Ends: Bagged, placed one layer thick, 6 inch average thickness, concealed with topsoil fill.

B. Sloped Grade At Retaining Wall: Individual riprap units, 6 inch thickness; placed prior to finish topsoil.

END OF SECTION 31 3700

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 33 0513 MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Monolithic concrete manholes with masonry transition to lid frame, covers, anchorage, and accessories.

B. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.

C. Monolithic FRP manholes with transition to lid frame, covers, anchorage, and accessories.

D. Masonry manhole sections with masonry transition to lid frame, covers, anchorage, and accessories.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Section 03 3000 - Cast-in-Place Concrete.

C. Section 04 2000 - Unit Masonry: Masonry units and mortar and grout.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures; American Concrete Institute International; 2009.

C. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2008).

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

E. ASTM C55 - Standard Specification for Concrete Brick; 2009.

F. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2010.

G. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 2009.

H. ASTM C478M - Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric]; 2009.

I. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

Manhole Structures, Pipes, and Laterals; 2008.

J. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals [Metric]; 2008b.

K. ASTM D3753 - Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and Wetwells; 2005.

1.04 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 (ASTM C478M), with resilient connectors complying with ASTM C923 (ASTM C923M).

B. Manhole Sections: ASTM D3753, glass-fiber reinforced polyester with integral steps.

C. Concrete: As specified in Section 03 3000.

D. Mortar and Grout: As specified in Section 04 2000, Type S.

E. Concrete Reinforcement: As specified in Section 03 3000.

2.02 CONFIGURATION

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 MANHOLES

A. Place concrete base pad, trowel top surface level.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.

C. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated metal items.

D. Cut and fit for pipe.

E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

F. Coordinate with other sections of work to provide correct size, shape, and location.

3.04 MASONRY WORK

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Lay masonry units in running bond. Course one unit and one mortar joint to equal 8 inches.

C. Form concave mortar joints.

D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Install joint reinforcement 16 inches on center.

F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening.

END OF SECTION 33 0513

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

SECTION 33 4111 SITE STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Connection of drainage system to municipal sewers.

C. Catch basins, Plant area drains, Paved area drainage, Site surface drainage, Detention tank, and Detention basin.

1.02 RELATED REQUIREMENTS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

C. Section 31 2316 - Excavation: Excavating of trenches.

D. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

E. Section 31 2323 - Fill: Bedding and backfilling.

F. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

G. Section 33 0513 - Manholes and Structures.

H. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

1.03 REFERENCE STANDARDS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; American Association of State Highway and Transportation Officials; 2003.

C. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2009.

D. ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines; 2009.

E. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe; 2007.

F. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2007.

G. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2011.

H. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe [Metric]; 2011.

I. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2004 (Reapproved 2009).

J. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2010.

K. ASTM C443M - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric); 2010.

L. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2009a.

M. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; 2011.

N. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2006.

O. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2011.

P. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

Q. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

R. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008.

1.04 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
B. Refer to Division 01 8113 for LEED Sustainability Requirements.

1.06 REGULATORY REQUIREMENTS

A. Perform all work in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Conform to applicable code for materials and installation of the Work of this section.

1.07 PROJECT CONDITIONS

A. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to foundation drainage system.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide material in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

2.02 PIPE ACCESSORIES

A. Provide all fittings, joints, and other required appurtenances in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Sewer Service " in large letters.

2.03 CATCH BASIN, CLEANOUT, AND AREA DRAIN COMPONENTS

A. Provide in accordance with the 2019 Edition of the New Mexico State Department of Transportation Standard Specifications for Highway and Bridge Design.

2.04 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2316.13.

B. Cover: As specified in Section 31 2316.13.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 31 2316.13 for additional requirements.

B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION – PIPE

A. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

B. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.

C. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

3.03 INSTALLATION - CATCH BASINS AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

END OF SECTION 33 4111