

Albuquerque Public Schools

Ernie Pyle Middle School

Reroofing & HVAC Replacement

1820 Valdora Ave SW
Albuquerque, NM 87105

Bid #RFP #20-034RRR

PROJECT MANUAL

GTH Project No.: 1910

APS Project No.: 450

January 31, 2020

100%



ALBUQUERQUE
PUBLIC SCHOOLS

GREGORY T. HICKS AND ASSOCIATES, P.C.

• ARCHITECTS • PLANNERS •

110 Second Street SW • Suite 204 • Albuquerque, NM 87102 • (505) 243-7492



APS Bid documents – 2012.1 edition PROJECT CONTACTS

PROJECT: Ernie Pyle Middle School Reroofing & HVAC
Replacement
ADDRESS: 1820 Valdora Rd SW
Albuquerque NM 87105

OWNER: The Board of Education
Albuquerque Municipal School District No. 12,
Bernalillo and Sandoval Counties, New Mexico
(hereinafter, "APS")

OWNER'S PROJECT CONTACT: Karen Alarid, AIA, Director
Facilities Design & Construction
915 Oak Street SE
Albuquerque, N M 87106
(505) 848-8818
Alarid_k@aps.edu

OWNER'S PROCUREMENT CONTACT: Robert Rodarte, MPA, CPPO
Procurement Division
6400 Uptown Blvd NE
Suite 500-E
Albuquerque, NM 87110
(505) 878-6125
Robert.rodarte@aps.edu

DESIGN PROFESSIONAL OF RECORD: Gregory T. Hicks & Associates, P. C.
110 Second St. SW #204
Albuquerque NM 87102 505-243-
7492

APS PROJECT MANAGER: Ben Harris, CSI, CDT, Construction
Manager
Facilities Design & Construction
915 Oak Street SE
Albuquerque, NM 87106
(505) [848-8708

ARCHITECTURAL AND ENGINEERING FIRMS

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

ARCHITECT: Gregory T. Hicks & Associates, P. C.
110 Second St. SW #204
Albuquerque NM 87102
(505) 243-7492
GREGORY T. HICKS, OWNER/PRINCIPAL gregh@gthicks.com
ALAN ROBERTSON, ROOFING SPECIALIST alanr@gthicks.com

CIVIL ENGINEER: N/A

ELECTRICAL ENGINEER N/A

INTERIORS N/A

MECHANICAL ENGINEER BG BUILDING WORKS
7007 Wyoming Blvd NE
Albuquerque NM 87109
(505) 323-9070
MORGAN ROYCE, PRINCIPAL PE, LEED AP
mbroyce@bgbuildingworks.com

LANDSCAPE ARCHITECT N/A

STRUCTURAL ENGINEER N/A

00 0000-2

PROJECT MANUAL TABLE OF CONTENTS

Project Contacts / Table of Contents

Request for Bids

APPENDICES: FORMS

- A. General Contractor's Statement of Qualifications Form w/Attachment Forms A - K
- B. Subcontractor's Statement of Qualifications Form w/Attachment Forms A - I
- C. Subcontractor Listing Form (including Subcontractor Listing Requirements and Assignment of Anti-Trust Claims)
- D. Proposal for Lump Sum Contract
- E. Bond Review and Approval Form
- F. Agent's Affidavit
- G. Campaign Contribution Disclosure Form
- H. Conflict of Interest Form and Debarment/Suspension Certification Form
- I. Listing Form 00 4334 — Subcontractor Qualifications Questionnaire

00 3100	Supplemental Information (Asbestos Considerations)
00 4000	Enumeration of the Contract Documents
00 5000	Owner/Contractor Agreement
00 6600	Minimum Wage Rate Information
00 7000	General Conditions
00 8100	List of Drawings
00 8200	Index to Technical Specifications



ALBUQUERQUE PUBLIC SCHOOLS

**REQUEST FOR PROPOSALS
FOR CONSTRUCTION**

RFP NUMBER: 20-034-RRR

Ernie Pyle Middle School Reroofing & HVAC Replacement

APS PROJECT NO. 450

**CAPITAL OPERATIONS
FACILITIES, DESIGN & CONSTRUCTION
&
THE PROCUREMENT DEPARTMENT**

**6400 UPTOWN BLVD. NE, SUITE 500E
ALBUQUERQUE, NM 87110**

RFP TABLE OF CONTENTS

- I. OVERVIEW OF RFP & PROJECT 4
 - A. PURPOSE OF THIS REQUEST FOR PROPOSALS 4
 - B. BACKGROUND – ALBUQUERQUE PUBLIC SCHOOLS 4
 - C. PROJECT DESCRIPTION 4
 - D. PROJECT FUNDING 4
 - E. PROJECT MANAGEMENT SOFTWARE 5
 - F. NEW MEXICO PREVAILING WAGE RATES 5
 - G. PERMITS, PLAN CHECKING FEES, OTHER CHARGES 6
 - H. APS BEHAVIORAL POLICIES APPLY TO CONTRACTOR’S PERSONNEL 6
- II. CONDITIONS GOVERNING THE PROCUREMENT 7
 - A. SEQUENCE OF SELECTION PROCESS EVENTS 7
 - B. EXPLANATION OF SELECTION PROCESS EVENTS 8
 - 1. ISSUE RFP & CONSTRUCTION DOCUMENTS MADE AVAILABLE TO POTENTIAL OFFERORS 8
 - 2. MANDATORY PRE-PROPOSAL CONFERENCE 8
 - 3. SUBMISSION REQUESTS FOR PRIOR APPROVAL OF PRODUCT SUBSTITUTIONS 9
 - 4. SUBMISSION OF WRITTEN QUESTIONS 9
 - 5. LAST ADDENDUM PRIOR TO SUBMISSION OF PROPOSALS 9
 - 6. SUBMISSION OF PRICE PROPOSALS, AND 10
 - 7. SUBMISSION OF TECHNICAL PROPOSALS 10
 - 8. PROPOSAL EVALUATION 10
 - 9. PROFESSIONAL COURTESY LETTER 10
 - 10. CONTRACT NEGOTIATIONS 10
 - 11. APS BOARD APPROVAL 10
 - 12. NOTICE OF AWARD 10
 - C. STANDARD CONDITIONS GOVERNING THE PROCUREMENT 11
 - 1. PROTESTS 11
 - 2. INCURRING COST 11
 - 3. THIRD-PARTY OR SUBCONTRACTING GC CONTRACT RESPONSIBILITIES 11
 - 4. AMENDMENTS OR MODIFICATIONS TO A PROPOSAL BY OFFEROR 11

Ernie Pyle Middle School Reroofing & HVAC Replacement

5. OFFEROR’S RIGHTS TO WITHDRAW PROPOSAL 11

6. DISCLOSURE OF PROPOSAL CONTENTS..... 12

7. CONFIDENTIAL DATA 12

8. TERMINATION OF RFP..... 12

9. SUFFICIENT APPROPRIATION..... 12

10. OFFEROR QUALIFICATIONS..... 12

11. RIGHT TO WAIVE TECHNICAL IRREGULARITIES..... 13

12. POTENTIAL CIVIL AND CRIMINAL PENALTIES 13

13. RELEASE OF INFORMATION 13

14. CLARIFICATIONS FROM OFFERORS 13

15. LICENSING REQUIREMENTS..... 13

16. SUBCONTRACTORS..... 13

17. OBJECTION TO PRE-LISTED SUBCONTRACTORS 13

18. NON-CONFORMING PROPOSALS 14

D. DEFINITIONS AND TERMINOLOGY 14

III. CONTRACTUAL AGREEMENT AND BONDS..... 17

1. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR..... 17

2. COMPLETION TIME AND LIQUIDATED DAMAGES 17

3. TIME OF DELIVERY AND FORM OF BONDS..... 17

4. SUBCONTRACTOR BONDING 17

IV. PROPOSAL RESPONSE FORMAT AND ORGANIZATION 18

A. NUMBER OF PROPOSALS..... 18

B. SUBMISSION OF PRICE PROPOSAL – VOLUME I 18

C. SUBMISSION OF TECHNICAL PROPOSALS – VOLUME II 21

IMPORTANT NOTE ON THE TECHNICAL PROPOSAL’S CONTENTS..... 25

V. PROPOSAL EVALUATION 26

A. EVALUATION CRITERIA 26

Ernie Pyle Middle School Reroofing & HVAC Replacement

I. OVERVIEW OF RFP & PROJECT

A. PURPOSE OF THIS REQUEST FOR PROPOSALS

Albuquerque Public Schools (APS) is requesting competitive sealed 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 Request for Proposals (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 RFP, especially the **mandatory requirements**, shall visit the site of 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 appropriate contact listed herein and the necessary changes shall be accomplished by addendum.

This is a qualifications-based selection with cost as a consideration. The Offeror is required to provide, as part of the Technical Proposal, the qualifications and other documents requested in this RFP. The Price Proposal will be evaluated separately from the Technical Proposal.

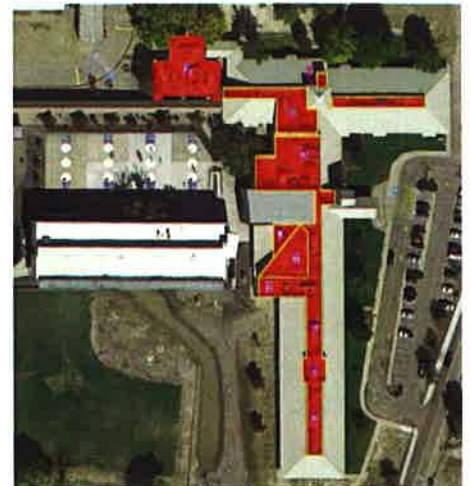
The award of a contract for construction shall take into consideration certain contractor qualifications and performance factors that add value to a procurement contract. Factors such as contractor's past performance, technical expertise and experience, management capabilities and resources, subcontractor teams and craft personnel resources will form a basis for the criteria to be considered, in addition to the lump sum price to perform the scope of work. Award shall be made in accordance with the terms, conditions, and requirements stated herein.

B. BACKGROUND – ALBUQUERQUE PUBLIC SCHOOLS

APS is the nation's 28th largest school district covering a 1,200 square mile geographical area that encompasses all of the Albuquerque metro area in Bernalillo County and one location in Sandoval County, New Mexico. An elected board governs the district. APS maintains the largest collection of public buildings in the state with approximately 14 million square feet of traditional school buildings, portable classrooms, and administrative offices. The district strives to keep pace with Albuquerque's growth. The approximately 90,000 APS students plus 5,000 charter school students and 13,000 employees require a continuous building program that includes remodeling or refurbishing projects, new additions, and new schools.

C. PROJECT DESCRIPTION

The Ernie Pyle Middle School- Classroom Buildings Reroof and Mechanical Replacement involves the complete reroofing of the flat roof sections of the Classroom Buildings as shown in red bounded by yellow. The project includes the complete mechanical system replacements at these same buildings. The only exception to this is the building to the northwest, the upper left red building not bounded in yellow, Roof Q. That building is slated for future demolition so there will only be roof repair on that building and HVAC will not be replaced.



Ernie Pyle Middle School Reroofing & HVAC Replacement

These buildings are currently evaporatively cooled which creates extremely high humidity problems in the buildings. The new system will consist of standard gas-fired roof top units (RTUs) with refrigerated cooling. Electrical and plumbing work associated with the mechanical and roof systems will be replaced as needed.

The roofing work will be done in accordance with the standard APS roofing standard of sloped polyisocyanurate insulation, three mopped plies of asphaltic roof membrane, and a granulated cap sheet for approximately 20,396 SF of reroofing, plus repair of 5,098 SF of Roof Q, which is expected to be demolished in the near future.. Some of the areas being reroofed are surrounded by walls from sloped roofs. These depressed areas were intentionally designed to hide the mechanical equipment from street view, but they also create “pools” or catchment areas for precipitation so careful detailing and roof drainage and drainage overflow systems will be required. These areas are crowded with mechanical equipment/ductwork and there is limited or difficult access to mechanical equipment due to closeness to the walls and other obstructions. The new RTUs are expected to be smaller than the existing units helping ease these access problems. Due to the differing size of the new units and different duct orientations on the new RTUs, the project will require custom-made HVAC curbs.

The project is scheduled for construction during the summer of 2020. To meet this schedule, the design is being expedited and the schedule is to bid in February 2020 for a Notice to Proceed in March so the selected contractor can order equipment and curbs for delivery when school lets out for the summer. The Maximum Allowable Construction Costs (MACCs) APS is currently estimating is \$743,200 for reroofing and \$1,400,000 for HVAC. Funding is by APS and does not include PSFA funds.

D. PROJECT MANAGEMENT SOFTWARE

The successful Offeror shall purchase, at the Offeror’s expense, one or more seat licenses for APS’s Project Management Software, as needed for the General Contractor. Subcontractors are not required to purchase licenses. APS will provide training on the use of the project management software. Further, the successful Offeror is required to work with the APS Staff Architect and the Design Professional to ensure that all project communication, correspondence, submittals, change orders, pay requests, etc. are submitted, maintained, and managed through APS’s web-based Project Management Software.

The current project management software APS utilizes is e-Builder.

E. NEW MEXICO PREVAILING WAGE RATES

All work covered by this RFP shall be in accordance with applicable state laws and, if price proposal amount is \$60,000 or greater, is subject to the minimum wage rate determination issued by the office of the NM Workforce Solutions Department and 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.

Ernie Pyle Middle School Reroofing & HVAC Replacement

F. 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 City of Albuquerque (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 are to be included in the Offeror's price proposal.

G. APS BEHAVIORAL POLICIES APPLY TO CONTRACTOR'S PERSONNEL

All current behavioral policies of the APS Board of Education such as, but not limited to, "no smoking" and "no alcoholic beverages" on APS property, shall be deemed to be in force for the Contractor's work forces when they are on APS property, including the project work site.

II. CONDITIONS GOVERNING THE PROCUREMENT

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

A. SEQUENCE OF SELECTION PROCESS EVENTS

	Event	Responsible Party	Date	Location
1.	Publish RFP	APS Procurement & Design Professional	February 7, 2020	Public Advertisement; Web Advertisement; Academy Reprographics
2.	Mandatory Pre-Proposal Conference	FD&C, Design Professional, APS Procurement	February 14, 2020 9:00 AM	1820 Valdora Ave SW Albuquerque NM87105
3.	Submission of Requests for Prior Approval of Product Substitutions	Potential Offerors	February 21, 2020	Sent to Design Professional
4.	Submission of Written Questions	Potential Offerors	February 21, 2020	Sent to Design Professional or APS Procurement
5.	Release of Last Addendum	FD&C, Design Professional, APS Procurement	February 24, 2020	Web Advertisement; Academy Reprographics
6.	Submission of Price Proposal – Volume I	Offerors	March 3, 2020 2:00 PM	APS Procurement 6400 Uptown Blvd. NE Suite 500E Albuquerque, NM 87110
7.	Submission of Technical Proposal – Volume II	Offerors	March 4, 2020 2:00 PM	APS Procurement 6400 Uptown Blvd. NE Suite 500E Albuquerque, NM 87110
8.	Proposal Evaluation	APS Procurement, Evaluation Committee	March 6, 2020	FD&C APS 915 Oak Street SE Albuquerque, NM 87106
9.	Professional Courtesy Letter	APS Procurement	March 9, 2020	APS
10.	Contract Negotiations	FD&C, APS Procurement	March 9, 2020	APS
11.	APS Board Approval	FD&C, APS Procurement	March 18, 2020	APS Board Meeting
12.	Notice of Award/Notice to Proceed	FD&C, APS Procurement	March 19, 2020	APS

NOTICE: APS 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.

Ernie Pyle Middle School Reroofing & HVAC Replacement

B. EXPLANATION OF SELECTION PROCESS EVENTS

1. ISSUE RFP & CONSTRUCTION DOCUMENTS MADE AVAILABLE TO POTENTIAL OFFERORS

This RFP is issued by APS in accordance with the provisions of Sections 13-1-111 and 13-1-117 NMSA 1978.

The 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.

Proposal Documents (RFP, construction drawings, specifications, etc.) may be obtained at Academy Reprographics upon payment of \$200.00 for each complete set. CHECKS SHOULD BE MADE PAYABLE TO ALBUQUERQUE PUBLIC SCHOOLS. Incomplete sets will not be issued. A compact disc containing the RFP documents only is available for a fee of ten dollars (\$10) at Academy 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: Gregory T. Hicks and Associates, P. C. 505-243-7492

1. Dodge Reports, Telephone: (505) 565-2440
2. Construction Reporter, 1609 2nd St. NW, Albuquerque, NM 87102, Telephone: (505) 243-9793
3. Academy Reprographics, website: www.academyplans.com, Telephone: (505) 821-6666

2. MANDATORY PRE-PROPOSAL CONFERENCE

Attendance at the pre-proposal meeting is mandatory. The pre-proposal meeting will be conducted at Ernie Pyle MS 1820 Valdora Rd. SW, Albuquerque NM 87105 . 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 following the pre-proposal meeting.

This meeting provides potential Offerors an opportunity to request clarification about the procurement process and discuss the intent of the project with FD&C 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 PRE-PROPOSAL MEETING PRECLUDES PARTICIPATIONS 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.

Ernie Pyle Middle School Reroofing & HVAC Replacement

To arrange for access to the project site, contact the APS Staff Architect/Engineer:

APS Facilities Design & Construction
Tony Sparks, Project Manager HVAC
Phone: 505-848-8816 X 67319
Email: tony.sparks@aps.edu

3. SUBMISSION 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.

4. SUBMISSION OF WRITTEN QUESTIONS

This deadline for the submission of written questions is set at least 7 calendar days prior to the Proposal Submission to allow the APS Procurement Contact and the Design Professional to respond in an addendum.

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 the APS Procurement Contact or APS FD&C as required. Responses to all questions will be incorporated into an addendum issued subsequently by the Design Professional.

Design Professional: Gregory T. Hicks and Associates, P. C.
Gregory T. Hicks, Owner/Principal
Alan Robertson, Roofing Specialist

APS Procurement Contact:
Robert Rodarte, Senior Buyer (Construction)
505-878-6125
Robert.Rodarte@aps.edu

5. 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 4 calendar days prior to the Proposal Submission. The only exception to this deadline is the issuance of an addendum that postpones the date for the Submission of Proposals.

By this deadline, the Design Professional (in consultation with APS Procurement and FD&C) shall have responded by addendum to all properly submitted Request for Prior Approval of Product Substitutions and all properly submitted written questions.

All addenda shall become part of the RFP and any information required shall be included in each Offeror's proposal.

Ernie Pyle Middle School Reroofing & HVAC Replacement

6. SUBMISSION OF PRICE PROPOSALS, AND
7. SUBMISSION OF TECHNICAL PROPOSALS

Receipts of Proposals:

Each proposal will consist of Volume I – Price Proposal (one original) and Volume II – Technical Proposal (one original plus five copies). 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.

Deliver Proposals to:

**Albuquerque Public Schools
Procurement Department
6400 Uptown Blvd. NE
Suite 500E
Albuquerque, NM 87110**

For US Postal Service:

**Albuquerque Public Schools
Procurement Department
P.O. Box 25704
Albuquerque, NM 87125-0704**

APS Procurement will time stamp proposals upon arrival at the Procurement Office and hold them until the evaluation. A public log will be kept of the names and submittal times of all proposals. **Proposals delivered after the deadline will be deemed non-responsive.** It is solely the Offeror’s responsibility to ensure the proposals arrive at the appointed date, time, and location. Proposals may be delivered early to avoid any possible delay of the submissions.

Proposals may be hand carried/delivered or shipped/mailed by common carrier, courier of the US Postal Service. **No other method of delivery will be allowed (i.e., telephone, telegraphic, facsimile, e-mail, etc.).**

8. PROPOSAL EVALUATION
The Evaluation Committee will meet and review all proposals.
9. PROFESSIONAL COURTESY LETTER
APS may send a Courtesy Letter to all Offerors stating which Offeror is being recommended to the Board of Education.
10. CONTRACT NEGOTIATIONS
The Owner reserves the right to enter into negotiations with apparent successful Offeror per 13-1-115 NMSA 1978.
11. APS BOARD APPROVAL
The successful Offeror shall be recommended to the Board of Education for their approval.
12. NOTICE OF AWARD
APS may send a Notice of Award 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. The Owner makes no representations, written or oral, that it will enter into any form of agreement with any Contractor.

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 that give rise to the protest. Protests must be submitted in written form to:

Robert Rodarte, MPA, CPPO
Procurement Division
6400 Uptown Blvd NE
Suite 500-E
Albuquerque, NM 87110
(505) 878-6125
Robert.rodarte@aps.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 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 of 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 **45 days** after the actual date of the receipt thereof (Proposal Due Date).

Ernie Pyle Middle School Reroofing & HVAC Replacement

6. DISCLOSURE OF PROPOSAL CONTENTS

Proposal contents will be kept confidential until conclusion of successful contract negotiations. At that time, all proposals will be open to the public, except for the material which has clearly been noted and determined by the APS Procurement Department to be proprietary or confidential as noted by the Offeror.

7. CONFIDENTIAL DATA

Confidential data is normally restricted to confidential financial information concerning the Offeror's organization and data that qualifies as trade secret under the Uniform Trade Secrets Act, 57-3A-7 NMSA 1978. 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 APS. The RFP process may be terminated at any time if sufficient appropriations or authorizations do not exist. Such termination will be effected by sending written notice to the Offeror. APS'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 be effected 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 factors 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 the Owner all such information and data for this purpose as the Owner may request including but not limited to: proof of financial resources, production or service facilities, personnel and experience adequate to complete the project, etc. The Owner reserves the right to reject any Proposal if the evidence submitted by, or investigation of, such Offeror fails to satisfy the 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 13-1-83 and 13-1-85 NMSA 1978.

Ernie Pyle Middle School Reroofing & HVAC Replacement

11. RIGHT TO WAIVE TECHNICAL IRREGULARITIES

APS reserves the right to waive technical irregularities, (see “Technical Irregularities” in the Definitions and Terminology section below). APS 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.

12. POTENTIAL CIVIL AND CRIMINAL PENALTIES

The Procurement Code, 13-1-28 through 13-1-199 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 Offeror 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.

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 the Contractor’s valid licenses necessary to perform the work in the State of New Mexico. Copies of the subcontractors’ licenses need by provided only if requested by the Owner.

16. SUBCONTRACTORS

The Subcontractors Fair Practices Act 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 Offer may, at their option, (1) withdraw their proposal, or (2) submit an acceptable substitute subcontractor with no increase in the proposal price. In the event of withdrawal under this paragraph, Bid Security will not be forfeited, notwithstanding anything to the contrary elsewhere in this RFP.

Ernie Pyle Middle School Reroofing & HVAC Replacement

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 RFP, including appropriate abbreviations.

“Albuquerque Public Schools”: Board of Education, Albuquerque Municipal School District Number 12, Bernalillo and Sandoval Counties, New Mexico (Also called **“APS”**).

“Architect”: shall mean 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 APS that a firm has been selected to enter into negotiations for a contract for construction services.

“Construction Contractor”: shall mean the successful Offeror awarded the contract that holds a current State of New Mexico general contractor license designation of GB-98

“Contract”: shall mean an agreement between APS and a New Mexico licensed contractor for the work covered by this RFP.

“Contract Documents”: shall mean any one or combination of the following documents: RFP, Addenda, Agreement Between the Owner and the General Contractor for Construction, General Conditions of the Contract for Construction, and the drawings and specifications.

“Design Professional”: shall mean an architect or engineer

“Determination”: shall mean the written documentation of a decision made the APS Procurement Department including findings of fact required to support a decision. A determination becomes part of the procurement file to which it pertains.

“Engineer”: shall mean a member of the project design team who is a New Mexico licensed engineer and is responsible for the engineering services.

“Evaluation Committee”: shall mean a body constituted to evaluation proposals and make a selection recommendation.

“Facilities, Design & Construction”: shall mean a department of APS requesting proposals for the work covered by this RFP. (Also called **“FD&C”**)

“Firm”: shall mean the company or other business entity referenced 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.

Ernie Pyle Middle School Reroofing & HVAC Replacement

“General Provisions”: shall mean the terms **“can”, “may”, “should”, “preferable”, 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 Offeror’s proposal.

“LEED®” (Leadership in Energy and Environmental Design): shall mean the Green Building Rating System™ that 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”: shall mean 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 APS Procurement Department and a final decision on rejection will be made by the APS Procurement Director.

“Offeror”: shall mean 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”: shall mean APS

“Owner’s Project Team”: shall mean FD&C and others in the APS District, FD&C Construction Staff Architect, Construction Manager, representatives of the school or district facility, and the Design Professional’s design team.

“Pre-Listed Subcontractors”: shall mean subcontractors, of any tier, that the Offeror is required to list, at the time they submit their proposal in response to this RFP.

“Prime Contractor”: shall mean the New Mexico licensed contractor selected for this project.

“Project Design Team or Contract Architect or Engineer Design Team”: shall mean 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”: shall mean the Offeror’s response to this RFP.

“Request for Proposals”: shall mean this document, any attachments incorporated by reference, and any addenda issued for use in soliciting proposals for construction of this project. (Also called **“RFP”**)

“Resident Business” or “Resident Contractor” or “Veteran Resident Contractor”: shall mean an entity that has applied for and received a valid resident preference certificate issued by the New Mexico Taxation and Revenue department pursuant to 13-1-21 or 13-1-22 NMSA 1978.

“RFP Documents”: shall mean any on or any combination of the following documents: RFP, technical proposal, price proposal, financial proposal, contractor’s qualifications statement, and subcontractor’s qualifications statement, contracts or agreements.

“Responsive Offer” or “Responsive Proposal”: shall mean an offer or proposal which conforms in all material respects to the requirements set forth in the RFP as determined by the APS Procurement Department. Material respects of an RFP include, but are not limited to, quality, quantity or delivery requirements.

Ernie Pyle Middle School Reroofing & HVAC Replacement

“Responsible Offeror”: shall mean 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.

“Staff Architect” or “Construction Manager”: shall mean the person designated as the point of contact by FD&C to act on its behalf, concerning the scope of work and requirements of the contract documents for the project.

“Statement of Qualifications Forms”: shall mean the forms included as part of this RFP, which all Offerors shall complete, including the qualifications for the team member or partners and subcontractor proposed for the project.

“Technical Irregularities”: shall mean matters of form rather than of 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. APS Procurement may waive such irregularities, or allow an Offeror to correct them, if either is in the best interest of APS. 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 addendum and intended to be bound by its terms; or
 - b. The addendum involved had no effect on price, quality or quantity.

“User”: shall mean the school or district staff occupying the facility for which a project is being designed.

“User Contact”: shall mean the person designated by the district to speak on behalf of the staff concerning the scope of work and programming requirements for the project.

III. CONTRACTUAL AGREEMENT AND BONDS

1. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

The agreement for the work shall be the most current version of the APS Standard Form of Agreement Between the Owner and Contractor and the most current version of the General Conditions with the basis of payment as a stipulated sum. The most current version of all aforementioned documents are printed in their entirety in the Project Manual and is also available on the APS FD&C website at <http://www.apsfacilities.org/facilities> under "Contracts".

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 Appendix D, Proposal for Lump Sum Contract.

3. TIME OF DELIVERY AND FORM OF BONDS

- a) The Offeror will, prior to award of contract/commencement of work, furnish 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. 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.
- c) The bonds will be written on the AIA Document A312, Performance Bond and Labor and Materials Payment Bond.
- d) The AIA A312 1984 Labor and Materials Payment Bond shall be in effect, limit the time line Surety has to respond. 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.

4. 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 – Price Proposal

Volume II – Technical Proposal

Each volume has its own deadline for submission. Volume I on one day, and Volume II on the following day. Of course, the Offeror may choose to meet these deadlines by submitting both volumes at the same time by the deadline for Volume I. Only one (1) complete original proposal may be submitted by each Offeror for this project.

B. SUBMISSION OF PRICE PROPOSAL – VOLUME I

By the date and time of the Submission of Price Proposals, the Offeror shall submit one (1) original copy and one (1) digital copy on a flash drive each of the following documents:

Original Price Proposal, sealed in a separate envelope, to include:

___ **Item 1 Price Proposal Form**

1. Price Proposals shall be presented in the form of a total Base Bid under a Lump Sum Contract (using the Price Proposal Form provided in the Project Manual) 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 or partial 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 not include gross receipts or local options taxes. Taxes will be included in the Contracted Amount at prevailing rates as a separate item to be paid by the Owner.
4. If a joint proposal is being submitted, be sure to state the percentage of the work/services to be executed by each proposing 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 value of the work being performed by each contractor.

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

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 the Offeror's price proposal.

___ **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.

Ernie Pyle Middle School Reroofing & HVAC Replacement

___ 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 **Subcontractors Listing Forms (including (1) Subcontractor Listing Requirements and Assignment of Antitrust Claims Form & (2) Form 00 4334)**

This RFP includes two Subcontractor Listing Forms, each with its own value threshold and separate meaning.

Subcontractor Listing Form 1:

The “Combined List of Subcontractors and Assignment of Anti-Trust Claims” is included as Appendix C and must be completed and included in both the Price Proposal & the Technical 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 and their subcontractors and suppliers, at the time the Agreement Between the Owner and Contractor is signed, shall complete the Assignment of Antitrust Claims Form.

Subcontractor Listing Form 2:

The “Listing Form 00 4334 for Submission of Subcontractor Qualifications Questionnaires” is included as Appendix I and must be completed and included in both the Price Proposal & the Technical Proposal. For each subcontractor that meets one or both of the following criteria: (NOTE: Only the Form 00 4334 should be included in both proposals, the Statement of Subcontractor Qualifications and necessary attachments only need to be included in the Technical Proposal.)

1. Where the value of the subcontract is fifty thousand dollars (\$50,000) or five percent (5%) of the estimate, whichever is greater.
2. The subcontractor performing the trades listed below, regardless of the value of the subcontract (If the Offeror is to self-perform the work, then the Offeror is to complete the forms.):
 - Trade 1
 - Trade 2
 - Trade 3
 - Trade 4

NOTE: For both Subcontractor Listings, 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” (13-4-31 through 13-4-43 NMSA 1978).

Ernie Pyle Middle School Reroofing & HVAC Replacement

___ Item 6 **Resident Contractor (or Veteran Resident Contractor) Preference Certificate**

It will be the sole responsibility of any Potential Offeror claiming a Resident Contractor Preference or Veterans Resident Contractor Preference to apply to the State of New Mexico Taxation & Revenue Department 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 qualifications 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 bid or proposal a copy of a valid resident business certificate or valid resident contractor certificate issued by the NM Taxation & Revenue Department. When a public body awards a contract using a formal RFP process, a resident contractor shall be awarded the equivalent of five percent of the total possible points to be awarded based on the resident contractor possessing a valid resident contractor certificate.
2. 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 & Revenue Department. Through either an RFP process or an ITB process, the qualified veteran resident contractor shall receive 10% preference if their annual revenues are less than \$3,000,000. 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. In addition to the veteran resident preference certificate, the veteran resident contractor shall provide any additional documentation required to validate the percentage of preference to be awarded.
3. The preferences do not apply when the expenditure includes federal funds for a specific purchase.
4. 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.

___ Item 7 **Campaign Contribution Disclosure Form**

The blank form is included in an Appendix of this RFP. This form must be filed by a prospective contractor whether or not they, their family member, or their representative has made any contributions subject to disclosure.

___ Item 8 **Conflict of Interest and Debarment/Suspension Certification Form**

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

___ Item 9 **Contractor's State of New Mexico W-9 Form**

Each Offeror shall complete and provide a State of New Mexico W-9 Form.

___ Item 10 **Offeror's Contractor's License(s)**

Each Offeror shall provide a photocopy of their Contractor's License(s).

Ernie Pyle Middle School Reroofing & HVAC Replacement

C. SUBMISSION OF TECHNICAL PROPOSALS – VOLUME II

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 size will be no small than 10 point. **No information shall be submitted on electronic media that is not also printed as part of the technical proposal.**

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 – New Mexico Produced Work**

Any response that exceed the referenced page limitation shall be considered non-responsive and will not be considered for evaluation. If there are any questions regarding format requirements, please contact the APS Procurement Contact prior to submission of documents.

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.

By the date and time of Submission of Technical Proposals, Offeror shall submit one (1) original, plus six (6) photocopies, and one (1) digital copy on a flash drive each of the following documents:

Ernie Pyle Middle School Reroofing & HVAC Replacement

___ 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 acknowledgement 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(s) who have authority to contractually obligate the Offeror for the purposes 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 this procurement. Acknowledge that the information provided in the proposal is truthful, accurate, 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.
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 and Attachments**

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

NOTE: Offeror should submit only one (1) copy of Attachment F – Firm’s Written Safety Plan, bound separately from the rest of the Technical Proposal.

Ernie Pyle Middle School Reroofing & HVAC Replacement

___ Tab 3 **Subcontractors Listing Forms (including (1) Subcontractor Listing Requirements and Assignment of Antitrust Claims Form & (2) Form 00 4334) & Subcontractor Statement of Qualifications**

See Section IV. Proposal Response Format, B. Submission of Price Proposal, Item 5. A duplicate of those forms should be provided here in the Technical Proposal.

Additionally, completely fill out the Subcontractor Statement of Qualifications form (See Appendix for form) and its associate attachments, providing all requested information for each subcontractor that is listed on Form 00 4334.

___ 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, in the last five (5) projects you have completed for APS (or similar organizations), please answer the following:
 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 any 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 (such as references) in the evaluation of past performance.

Ernie Pyle Middle School Reroofing & HVAC Replacement

___ Tab 5 Project Staffing

Provide the following:

- a. Brief resume (to include: 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 3a. of the General Contractor's Statement of Qualifications. The project list may also include up to five (5) additional 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:

- a. Management Team: provide an organizational 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 the 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. Describe the firm's 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 of the full General Contractor's written safety plan is required as Attachment F of the General Contractors 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, subcontractors, and the owner.

Ernie Pyle Middle School Reroofing & HVAC Replacement

___ Tab 8 New Mexico Produced Work

One of APS's goals is to support New Mexico owned businesses and New Mexico based workers. Indicate the volume of work, by percentage, to be produced by New Mexico firms using New Mexico based employees on this project. Indicate the number of New Mexico based employees that will be part of the Project Team.

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 Tabs 4, 5, 6, 7, & 8 of the Technical Proposal is to provide a place for the proposer to make a concise presentation of the strength 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.

V. PROPOSAL EVALUATION

A. EVALUATION CRITERIA

The rubric to be used by the Evaluation Committee for each criteria are as follows:

Volume 2 – Technical Proposal

Past Performance.....	17 points
Project Staffing.....	13 points
Management Plan.....	15 points
Health & Safety.....	12 points

Detailed Scoring Guidelines for “Health & Safety”:

a.1 Summary Description of Health & Safety Plan.....	0.6
a.2 One full copy of Written Safety Plan.....	0.6
b. Competent Person Responsible/Capable of Implementing.....	0.6
c.1 Project Specific Health/Safety Risks.....	2.4
c.2 Describe Processes to Clearly Communicate Issues.....	0.6

Statement of Qualifications for General Contractors

a. Copy of Written Safety Program Compliant.....	1.2
b. List of Key Safety Personnel/Safety Manage.....	0.6
c. Experience Modification Rate for Past 5 Years.....	1.2
d. Recordable Incident Rate (Calendar Yr.) OSHA 300 Log.....	1.2
e. Free from Committing Violations of Laws.....	1.2

Statement of Qualifications for Subcontractors

a. Copy of Written Safety Program Compliant.....	0.6
b. Experience Modification Rate Past 5 Years.....	0.48
c. Recordable Incident Rate (Calendar Yr.) OSHA 300 Log.....	0.48
d. Free from Committing Violations of Laws.....	0.24

Total Possible Points..... 12.0

NM Produced Work.....	3 points
-----------------------	----------

Detailed Scoring Guidelines for “NM Produced Work”:

Based on the submitted Subcontractor Listing Form.

If all listed subcontractors are NM Firms.....	3 pts
If all accept one of the listed subcontractors are NM Firms.....	2 pts
If all accept two of the listed subcontractors are NM Firms.....	1 pts
If all accept three (or more) of the listed subs are NM Firms.....	0 pts

Subtotal.....60 points

Volume 1 – Price Proposal

Price Proposal.....	40 points
---------------------	-----------

TOTAL.....100 points

Interviews (if held).....	50 points
---------------------------	-----------

TOTAL.....150 points

APS intends to award this project to the Offeror whose proposal receives the highest number of points. APS reserves the right to reject any and all proposals, to waive technical irregularities, and to award the contract to the Offeror whose proposal APS deems to be in the best interest of APS.

**Ernie Pyle Middle School Reroofing & HVAC Replacement
Albuquerque Public Schools**

REQUEST FOR PROPOSAL FOR CONSTRUCTION # 20-034RRR

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 01/2020 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: _____

d. 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
- e. 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: _____

- f. 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 **30,000 square feet or more since 2013**, 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 **30,000 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 **30,000 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**)

(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

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 20,000 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)c.

- c. 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)

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

Surety Company

Contact

Surety Company

Contact

Surety Company

Contact

e. 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

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

- a. List any judgments against the firm during the past 5 years; use **Attachment J**
- 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?

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
Major Subcontractors: Guaranteed Maximum Price
 Other (Describe)

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

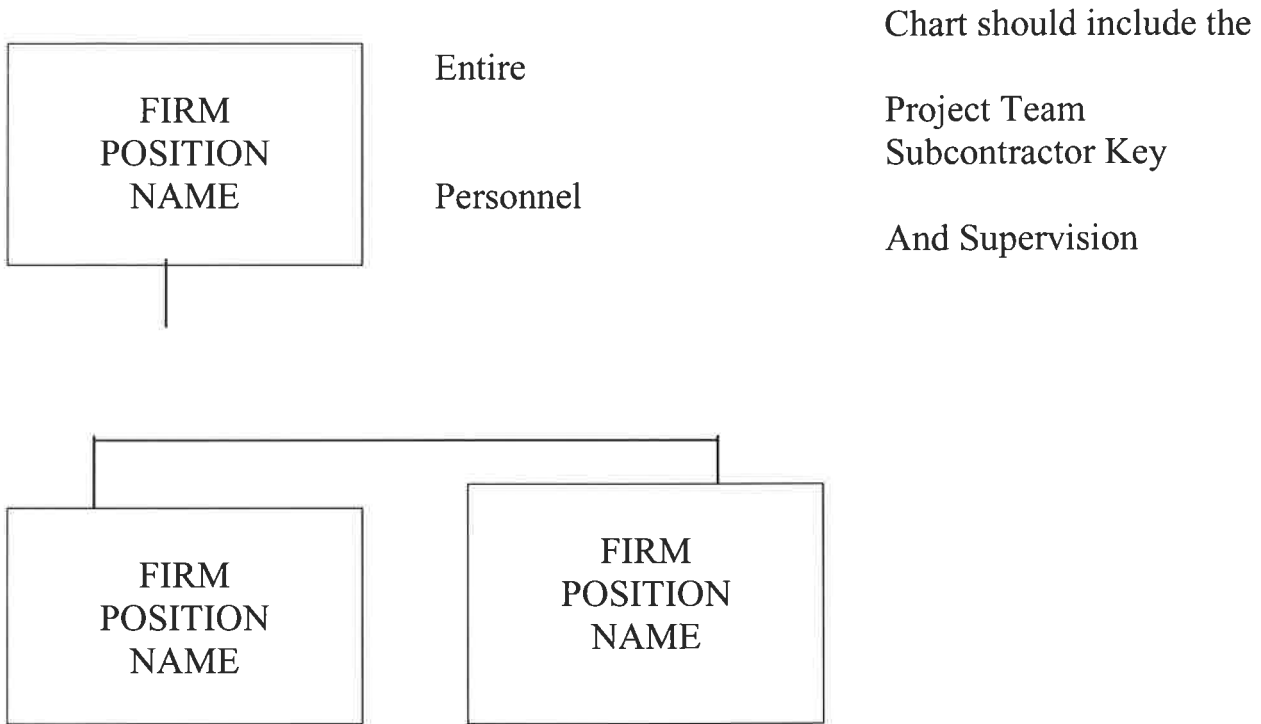
Identify project experience requested in the Statement at 4.a. (2) (3), 4.b. (2) (3), and 4.c. (2). Include the project Title and Location.

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

START DATE:

PROJECTED COMPLETION DATE:

PROJECT TITLE AND LOCATION:

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 Board of Education
School District

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?**

Ernie Pyle Middle School Reroofing & HVAC Replacement Albuquerque Public Schools

REQUEST FOR PROPOSAL FOR CONSTRUCTION # 20-034RRR

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 01/2020 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 educational facility, addition and/or renovation project of similar complexity and of 30,000 square feet or more since 2013, 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 30,000 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 30,000 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

(1) 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 as determined by a final non-appealable decision of a court or government agency?

Yes No (attach explanation)

7. 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)

8. QUALITY ASSURANCE

a. Does your firm have a written Quality Assurance Program? Yes No

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

mail Address

City/State/Zip

Telephone Number

Fax Number

E-

END OF SUBCONTRACTOR STATEMENT OF QUALIFICATIONS

ATTACHMENT A
SUBCONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 3.a. EXPERIENCE ON SIMILAR PROJECTS OVER VALUATION STATED IN 3.a

COMPLETE ONE FORM FOR EACH PROJECT LISTED ON THE QUESTIONNAIRE (MAXIMUM 3)

PROJECT DESCRIPTION

Project Type: _____ Owner: _____

Project Name and Location: _____

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

Original Contract Amt.: \$ _____ Completion Date/Percentage Complete: _____

DESIGN PROFESSIONAL

Name of Firm: _____ Contact Name: _____

GENERAL CONTRACTOR

Name of Firm: _____ Contact Name: _____

CUSTOMER SATISFACTION

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

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*)**

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

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

8. **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.

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

10. **Project Professionals and Project Owner Reference may be included.**

ATTACHMENT C
SUBCONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE:
5.b. PROJECTS CURRENTLY UNDER CONTRACT

<u>PROJECT TITLE AND LOCATION</u>	<u>START DATE</u>	<u>PROJECTED COMPLETION</u>

ATTACHMENT D
SUBCONTRACTOR'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 & History

ATTACHMENT E
SUBCONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 9.b. WRITTEN QUALITY ASSURANCE PROGRAM

SUBMIT ONLY ONE (1) COPY WITH SUBMITTAL PACKET

ATTACHMENT F
SUBCONTRACTOR'S STATEMENT OF QUALIFICATIONS

REFERENCE: 11.B. 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 Board of Education
(School District)

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: _____

**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: \$10,715.00

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.

c. See Instructions to Offerors, Section 00 2113 Paragraph 4.5, Subcontractors, for rules regarding changes in this list after Proposal award.

2. **PROJECT NAME:** Ernie Pyle Middle School Reroofing and HVAC Replacement

REQUEST FOR PROPOSAL NUMBER: 20-034RRR:

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 the District, 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 *

BID PROPOSAL FOR LUMP SUM CONTRACT

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%).

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. _____

FD+C Project No. 450

Project Name: Ernie Pyle Middle School Reroofing and HVAC Replacement

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: Board of Education
Albuquerque Municipal School District Number 12
Bernalillo and Sandoval Counties, New Mexico (hereinafter called "APS") for:

The construction of Ernie Pyle Middle School Reroofing and HVAC Replacement

The undersigned, as an authorized representative for the Offeror named above, in compliance with the Request for Proposals for the construction of a Rio Grande High School New Gymnasium, FD+C Project No. 394, 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 bids stated below. These bids 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 _____

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)

BID PROPOSAL FOR LUMP SUM CONTRACT

BASE BID: The Offeror agrees to perform all work for the construction of the Rio Grande High School New Gymnasium, as described in the Project Manual and as shown on the Drawings for the following Base Bid. Also provide Bid Lot amounts, amounts if requested.

(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 850 calendar days after the date of written Notice to Proceed, except as hereafter extended by valid written Change Order by the Owner, for Base Bid, and Bid Lots.

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 Five Hundred Dollars (\$1,500.00) 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 bid proposed for the Base Bid, subject to the availability of funds. APS may award one or more Bid Lots at the sole discretion of APS, subject to availability of funds.

BASE BID:

(1) Base Bid:

Total Base Bid Lump Sum: _____
_____ Dollars, (\$ _____)

BID LOTS

(2) Bid Lot No. 1 – Additive Alternate for Boiler Controls

Total Bid Lot No. 1 Lump Sum: _____
_____ Dollars, (\$ _____)

UNIT PRICES

(3) Unit Price No. 1 – Metal Deck Replacements

Total Unit Price No. 1 Unit Price: _____
_____ Dollars, (\$ _____)

(4) Unit Price No. 2 – Stucco Patch

Total Unit Price No. 2 Unit Price: _____
_____ Dollars, (\$ _____)

BID PROPOSAL FOR LUMP SUM CONTRACT

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 bid will be good and may not be withdrawn for a period of forty- five (45) calendar days after the scheduled closing time for receiving bid proposals.

Upon receipt of written notice of acceptance of this Bid, 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:

Owner's Representative or Governing Authority

Date: _____

AGENT'S AFFIDAVIT

THIS FORM MUST BE
USED BY SURETY

(To be filled in by Agent.)

STATE OF _____)

) ss.

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 _____, 2012 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 _____, 2011,

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
Rio Grande High School New Gymnasium
RFP 20-027RRR**

CONFLICT OF INTEREST – APPENDIX H

As utilized herein, the term “Vendor” shall mean that entity submitting a proposal to Albuquerque Public Schools 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 Albuquerque Public Schools (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 Albuquerque Public Schools 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 Albuquerque Public Schools 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 Albuquerque Public School’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 – APPENDIX I

For Submission of

**SUBCONTRACTOR
QUALIFICATIONS QUESTIONNAIRE**

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

DP/AE ESTIMATE OF TOTAL PROJECT COST: \$ 2,143,000.00

QUALIFICATION THRESHOLD FOR THIS PROJECT: \$ 107,150.00

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. Also, Per NMAC 1.4.8.12 D. (2): Subcontractor qualification questionnaires shall be required for all subcontractors identified in the Technical Proposal pursuant to the subcontractor listing requirements 1.4.8.13 NMAC, 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	

PROJECT: Ernie Pyle Middle School Reroof and HVAC Replacement

SUPPLEMENTAL INFORMATION

ASBESTOS CONSIDERATIONS

1. 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.
2. The Architect and the Contractor shall execute the attached asbestos document.
3. The following Considerations are made available as information for Bidders:

Not Applicable

DOCUMENT FOLLOWS

ALBUQUERQUE PUBLIC SCHOOLS

MAINTENANCE AND OPERATIONS

Environmental Management Department

915 Locust St SE
P.O. Box 25704
Albuquerque, New Mexico 87106
(505) 765-5950

JOHN DUFAY
DIRECTOR
MAINTENANCE & OPERATIONS

Asbestos Consideration

Ernie Pyle MS, Reroofing Project: Building #6 & #7

01/30/2020

PROJECT:

This report is provided for the purposes of an Asbestos Consideration for Ernie Pyle Middle School re-roofing project of Building #6, 1995 Classroom Addition, and Building #7, 1989 Classroom/Science Addition.

ASBESTOS CONTAINING MATERIALS:

Asbestos-Containing Materials (ACM), by definition, are any materials that contain greater than 1% of any form of Asbestos

- None

NON-ASBESTOS CONTAINING MATERIALS:

Materials that were sampled and returned as Non Asbestos containing.

Building #6, Classroom Addition-1995

Certified Asbestos Free

Building #7, Classroom/Science Addition-1989

Built up roofing

- Black Roofing
- Brown Roofing

Penetration Tar

- Black Tar

Flashing

- Gray/Black Flashing
- Black Roofing

A thorough inspection was conducted on the roof of Building #7, 1989 Classroom/Science Addition. Inspection and evaluation of the roofing materials, as established in EPA/NESHAP 40 CFR part 61, OSHA 29CFR1926.1101 and the Federal Register volume 60, number 125, revealed them to be in-tact and are not expected to become friable nor likely to release asbestos fibers, by forces acted upon them during the removal process. The EPA/NESHAP regulation, significantly reduces the requirements for asphaltic Asbestos-Containing Roofing Material. 40 CFR part 61 subpart M, App. "A" also identifies

work practices for use of a rotating blade cutter (roof saw) when cutting built up roofing into manageable sections. OSHA regulates worker exposure to asbestos and also significantly reduces the requirements for removal of asphaltic roofing materials. Federal Register volume 60, number 125 has detailed clarification which explains that removal of built up roofing containing asbestos performed under normal practices is not likely to expose workers or occupants to asbestos fibers.

PRECAUTIONS:

The contractor shall be aware that asbestos abatement or any other related asbestos work is *not included* in this contract. This is for informational purposes only.

Additional Asbestos Considerations are as follows:

- a) *All Regulated Asbestos-Containing Material (RACM) will be handled through the APS EMD.*
- b) As part of this report/inspection, you must be aware that there may be additional suspect friable materials not addressed in the initial inspection. If in the course of his work the contractor's personnel should encounter existing material of a suspicious nature which might possibly contain asbestos, certain precautions shall be taken: All work in the vicinity of the questionable material shall be stopped immediately. The Contractor shall notify the APS designated Inspector who will take samples and have laboratory analyses performed unless previously identified. If asbestos is found to be present, the Inspector will direct procedures to be followed. Under no circumstance is the Contractor to continue working on construction involving such suspicious or questionable materials.
- c) The Contractor is cautioned that the Inspector may not always be able to schedule the support work by APS or Contracted abatement qualified personnel as quickly as the Contractor would like to see it done. The Contractor shall be prepared to work on other areas of construction until such scheduled asbestos work by APS or Abatement Contractor is completed. Reasonable delays due to scheduling are to be anticipated and will not be justification for additional compensation to the Contractor.

R. Brian Schall

Environmental Inspector, EMD

ALBUQUERQUE PUBLIC SCHOOLS
DEPARTMENT OF FACILITIES PLANNING AND CONSTRUCTION
915 OAK STREET SE
PO BOX 25704
ALBUQUERQUE, NEW MEXICO 87125-0704
(505) 242-5865

RAQUEL REEDY
SUPERINTENDENT

KAREN ALARID
EXECUTIVE DIRECTOR



PROJECT NAME: _____
ADDRESS: _____
CITY: _____
STATE: _____

Project #: _____

In accordance with 40 CFR 763.99, this is to certify that the above referenced project drawings and specification have been reviewed and that to the best of our knowledge, no Asbestos Containing Building Materials (ACBM) were specified for the construction of this building.

Project Architect: _____ **Date:** _____
Firm: _____
Address: _____

This is to certify that for the above referenced project, to the best of our knowledge, no Asbestos-Containing Building Materials were used in the construction of this building.

Construction Contractor: _____ **Date:** _____
Firm: _____
Address: _____

AHERA/NIOSH Inspector: _____ **Date:** _____

ENUMERATION OF THE CONTRACT DOCUMENTS

PROJECT: Ernie Pyle Middle School Reroofing and HVAC Replacement

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.

00 4000-4

OWNER/CONTRACTOR AGREEMENT

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

00 5000-1

Agreement between the Owner and the Contractor

2008 Edition, APS

THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES; CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS COMPLETION

Project (short title): Ernie Pyle Middle School
Reroof and

Location: Albuquerque, New Mexico)

Invitation to Bid No.: _____

APS Contract No.: _____

Distribution to: Owner (2) Contractor Design Professional

This Agreement entered into this _____ day of _____, 20____, by and between the parties as follows:

THE OWNER:

THE BOARD OF EDUCATION
ALBUQUERQUE MUNICIPAL
SCHOOL DISTRICT NO. 12
("ALBUQUERQUE PUBLIC
SCHOOLS")
6400 UPTOWN BLVD, NE
ALBUQUERQUE, NM 87110
Telephone: (505) (880-3700)

THE CONTRACTOR:

(NAME OF FIRM)
(ADDRESS 1)
(ADDRESS 2)
(CITY/TOWN) _____, _____ (ZIP CODE)
Telephone: (505) (PHONE)
Fax: (505) (FAX NUMBER)

and, hereinafter "Owner".

APS CONSTRUCTION MANAGEMENT:

ALBUQUERQUE PUBLIC SCHOOLS
FACILITIES DESIGN & CONSTRUCTION
915 OAK STREET, SE
ALBUQUERQUE, NM 87106
Telephone: (505) 848-8810
Fax: (505) 246-9020

DESIGN PROFESSIONAL OF RECORD:

Gregory T. Hicks
Gregory T. Hicks & Associates, P. C.
110 Second St. SW
#204
Albuquerque NM _____, _____ 87102
Telephone: (505) 243-7492
Fax: N/A EMAIL: gregh@gthicks.com

RECITALS

WHEREAS, Contractor has represented to APS that it is specifically qualified to perform construction services of the nature contemplated by this Agreement; and

WHEREAS, Albuquerque Public Schools (APS) desires to engage the construction services of Contractor and Contractor desires to perform such services for APS.

The OWNER and the CONTRACTOR agree as set forth below.

ARTICLE 1

THE CONTRACT DOCUMENTS

The Contract Documents consist of the following:

Bid Form	Notice to Proceed
Agreement Between Owner and Contractor	Conditions of the Contract (General, Supplementary, and Other Conditions)
Performance Bond	Drawings
Labor and Material Payment Bond	Specifications
Agent's Affidavit	All Addenda Issued Prior to and All Modifications Issued after Execution of This Agreement
Certificate of Insurance	Exhibits A – G, attached
Assignment of Antitrust Claims	
Notice of Award	

These documents form the Contract, and all are as fully a part of the Contract as if attached to this Agreement or repeated herein. An enumeration of the Contract Documents appears in Article 7.

ARTICLE 2

THE WORK

The Contractor shall perform all the Work required by the Contract Documents for the following:

Ernie Pyle Middle School Reroof

ARTICLE 3

TIME OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

Should the Contractor neglect, refuse, or otherwise fail to complete the Work within the time specified for Substantial Completion, the Contractor agrees, in partial consideration for the award of this Contract, to pay to the Owner, by lump sum or by monthly payments if required by the Owner, the amount of _____ Dollars (\$ _____) per consecutive calendar day, not as a penalty, but as liquidated damages for such breach of this Contract.

Phased Construction: If the project contains multiple phases of construction, each phase shall be subject to the amount of liquidated damages per consecutive calendar day indicated in the paragraph above, if so noted below:

Phase 1: [Insert Contract Time] calendar days. Liquidated Damages [shall] [shall not] apply this phase.
 Phase 2: [Insert Contract Time] calendar days. Liquidated Damages [shall] [shall not] apply this phase.
 Phase 3: [Insert Contract Time] calendar days. Liquidated Damages [shall] [shall not] apply this phase.

ARTICLE 4
CONTRACT SUM

The Owner shall pay the Contractor in current funds for the performance of the Work, subject to additions and deductions by Change Order as provided in the Contract Documents, the Contract Sum of _____ Dollars (\$ _____).

The Contract sum is determined as follows:

Base Bid Amount.....	\$	_____
Bid Lot 1 - HVAC warranty/maintenance...	\$	_____
Bid Lot 2 - PV System.....	\$	_____
Bid Lot 3 - _____	\$	_____
Alternates (if any)	\$	_____
Award Amount	\$	_____
Gross Receipts Tax* @ _____ %	\$	_____
Contract Sum	\$	_____

*
 Gross receipts tax (GRT) shall be added as a line item to the Schedule of Values and in each approved Modification / Change Request (MCR) amount for change in the Work. During the course of the Project, any change in GRT rate will be applied to the remaining balance of Contract Sum by approved MCR.

ARTICLE 5
PROGRESS PAYMENTS

Based upon Applications for Payment submitted to the Design Professional by the Contractor and Certificates for Payment issued by the Design Professional, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents for the period ending the last day of the month as follows:

Not later than twenty-one (21) days following the end of the period covered by the Application for Payment of the portion of the Contract Sum properly allocable to labor, materials, and equipment incorporated in the Work and the portion of the Contract Sum properly allocable to materials and equipment suitably stored at the site or some other location agreed upon in writing for the period covered by the Application for Payment, less the aggregate of previous payments made by the Owner; less such amounts as the Design Professional shall determine for all incomplete Work and unsettled claims as provided in the Contract Documents.

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate provided by State statute regulating prompt payment.

ARTICLE 6

FINAL PAYMENT

Final payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the Owner to the Contractor within thirty (30) calendar days after notification of the Owner by the Design Professional that all incomplete and unacceptable work that was noted during the Substantial Completion Inspection and listed on the attachment to the Certificate of Substantial Completion has been corrected, and provided the Contract has been fully performed, a Certificate for Final Completion and final Certificate for Payment has been issued by the Design Professional; and the Contractor has provided to the Owner a certified statement of Release of Liens (AIA Document G706A or approved form) and Consent of Surety and such other documents required by the General Conditions.

ARTICLE 7

GENERAL AND SPECIAL PROVISIONS

7.1 This document shall be executed in no less than four (4) counterparts, each of which shall be deemed an original.

7.2 **Owner Provided Insurance.** See General Conditions for the Contract for Construction.

7.3 This Agreement shall be governed exclusively by the provisions hereof and by the laws of the State of New Mexico as the same from time to time exist.

7.4 Terms used in this Agreement which are defined in the Conditions of the Contract shall have the meanings designated in those Conditions.

7.5 As between the parties to this Agreement: As to all acts or failures to act by either party to this Agreement, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the relevant Date of Substantial Completion of the Work; and as to any acts or failures to act occurring after the relevant Date of Substantial Completion, not later than the date of the Owner's approval of the Final Certificate of Payment.

7.6 The Contractor shall hold harmless and indemnify the Owner against any and all injury, loss, or damage, including cost of defense - including but not limited to court costs and attorneys' fees - arising out of the negligent acts, errors, or omissions of the Contractor.

7.7 This Agreement shall not become effective until signed by all parties required to sign this Agreement.

7.8 The Contractor and his agents and employees are independent contractors and are not employees of the Owner. The Contractor and his agents and employees shall not accrue leave, retirement, insurance, bonding, use of Owner vehicles, or any other benefits afforded to employees of the Owner as a result of this Agreement.

7.9 The Contractor, upon Final Payment of the amounts due under this Agreement, releases the Owner, his officers and employees from his liabilities and obligations arising from or under this Agreement, including but not limited to all damages, losses, costs, liability, and expenses, including but not limited to attorneys' fees and costs of litigation that the Contractor may incur.

7.10 The Contractor agrees not to purport to bind the Owner or the State of New Mexico to any obligation not assumed herein by the Owner unless the Contractor has express written authority to do so, and then only within the strict limits of that authority.

7.11 Notices. All notices herein provided to be given, or which may be given, by either party to the other shall be deemed to have been fully given when made in writing and deposited in the United States mail postage prepaid, in the instance of Notice of Termination of Work, Certified Mail, Federal Express, or similar verifiable delivery method addressed as follows:

OWNER: ALBUQUERQUE PUBLIC SCHOOLS
FACILITIES DESIGN &
CONSTRUCTION
ATTN: KAREN ALARID, DIRECTOR
915 OAK STREET, SE
ALBUQUERQUE, NM 87106

CONTRACTOR: (NAME OF COMPANY)
(ADDRESS 1)
(ADDRESS 2)
(CITY/TOWN) , (ZIP CODE)

Nothing herein contained shall preclude the giving of any such written notice by personal service. The address to which notices shall be mailed to either party may be changed by written notice given by such party to the other as herein above provided.

7.12 Gender, Singular/Plural. Words of any gender used in this Agreement shall be held and construed to include any other gender, and words in the singular number shall be held to include the plural, unless the context requires otherwise.

7.13 Captions and Section Headings. The captions and section headings contained in this Agreement are for convenience of reference only, and in no way limit, define, or enlarge the terms, scope, and conditions of this Agreement.

7.14 Certificates and Documents Incorporated. All certificates and documentation required of the Contractor by the provisions of this Agreement shall be attached to this Agreement at the time of execution and are hereby incorporated by reference as though set forth in full in this Agreement to the extent they are consistent with its conditions and terms.

7.15 Separability. If any clause or provision of this Agreement is illegal, invalid, or unenforceable under present or future laws effective during the term of this Agreement, then and in that event it is the intention of the parties hereto that the remainder of this Agreement shall not be affected thereby.

7.16 Waiver. No provision of this Agreement shall be deemed to have been waived by either party unless such waiver be in writing signed by the party making the waiver and addressed to the other party; nor shall any custom or practice which may evolve between the parties in the administration of the terms hereof be construed to waive or lessen the right of either party to insist upon performance by the other party in strict accordance with the terms hereof. Further, the waiver by any party of a breach by the other party of any term, covenant, or condition hereof shall not operate as a waiver of any subsequent breach of the same or any other term, covenant, or condition thereof.

7.17 Entire Agreement. This Agreement represents the entire contract between the parties and, except as otherwise provided herein, may not be amended, changed, modified, or altered without the written consent of the parties hereto. This Agreement incorporates all of the conditions, agreements, and understandings between the parties concerning the subject matter of this Agreement, and all such conditions, understandings, and agreements have been merged into this written Agreement. No prior condition, agreement, or understanding, verbal or otherwise, of the parties or their agents shall be valid or enforceable unless embodied in this written Agreement.

7.18 Interchangeable Terms. For purposes of all provisions within this Agreement and all attachments hereto, the terms "Agreement" and "Contract" shall have the same meaning and shall be interchangeable.

7.19 Words and Phrases. Words, phrases, and abbreviations which have well-known technical or trade meanings used in the Contract Documents shall be used according to such recognized meanings. In the event of a conflict, the more stringent meaning shall govern.

7.20 Relationship of Contract Documents. The Contract Documents are complementary, and any requirement of one contract document shall be as binding as if required by all.

7.21 Pursuant to Section 13-1-191, NMSA 1978, reference is hereby made to the Criminal Laws of New Mexico (including Sections 30-14-1, 30-24-2, and 30-41-1 through 3, NMSA 1978) which prohibit bribes, kickbacks, and gratuities, violation of which constitutes a felony. Further, the Procurement Code (Sections 13-1-28 through 13-1-199, NMSA 1978) imposes civil and criminal penalties for its violation.

7.22 The Contract Documents, which constitute the entire Agreement between the Owner and the Contractor, are listed in Article 1 and, except for Modifications issued after execution of this Agreement, are enumerated in this Paragraph 7.22.

7.22.1 The following documents bound in the Project Manual dated: (PROJECT MANUAL DATE)

- Bid Form
- Agreement between Owner and Contractor
- Performance Bond
- Labor and Material Payment Bond
- Agent's Affidavit
- Certificate of Insurance
- Assignment of Antitrust Claims
- Notice of Intent to Award
- Notice of Award
- Notice to Proceed
- General Conditions

Supplementary Conditions
Addenda and Modifications

7.22.2 Specifications

Specifications: Refer to **Exhibit A**, attached to this Agreement

7.22.3 Drawings

Drawings, dated (DATE OF DRAWINGS) ; refer to **Exhibit B**, attached to this Agreement.

7.22.5 Addenda

No. _____	Description _____	Date _____
No. _____	Description _____	Date _____
No. _____	Description _____	Date _____
No. _____	Description _____	Date _____
No. _____	Description _____	Date _____
No. _____	Description _____	Date _____

7.22.6 Exhibits

- Exhibit A – Index to Technical Specifications
- Exhibit B – List of Drawings
- Exhibit C – Estimated Monthly Draw-down Schedule
- Exhibit D-1 – Modification/Change Request
- Exhibit D-2 – Change Order
- Exhibit E – Certificate of Substantial Completion
- Exhibit F – Certificate of Final Completion
- Exhibit G – APS Project Management System

END OF ARTICLE 7

Invitation to Bid No.: _____

APS Contract No.: _____

AGREED: This Agreement is entered into as of the day and year first written above.

CONTRACTOR By: _____

Printed Name:

Title:

Date: _____

Federal Identification Number:

NM CRS Identification Number:

OWNER: By: _____

Printed Name: Karen Alarid

Title: Director, Facilities Design & Construction Date: _____



Invitation to Bid No. _____
APS Contract No. _____

EXHIBIT A
INDEX TO TECHNICAL SPECIFICATIONS

(Attach list of Technical Specifications.)

DOCUMENT FOLLOWS



Invitation to Bid No. _____
APS Contract No. _____

EXHIBIT B
LIST OF DRAWINGS

(Attach List of Drawings)

DOCUMENT FOLLOWS



Invitation to Bid No. _____

APS Contract No. _____

EXHIBIT C
ESTIMATED MONTHLY DRAW-DOWN SCHEDULE

(Attach Contractor's Estimated Monthly Draw-down Schedule)

DOCUMENT FOLLOWS



Invitation to Bid No. _____
APS Contract No. _____

EXHIBIT D-1

MODIFICATION/CHANGE REQUEST

PROJECT NAME: _____ PROJECT NUMBER: _____

Contract Architect: _____ General Contractor: _____

Contract Architect's Consultant: _____

MC/R LOG NUMBER: _____ CURRENT DATE: _____

REQUESTED BY OWNER USER CONTRACTOR DESIGN PROFESSIONAL
OTHER INITIAL _____

NAME/ORGANIZATION: _____

DESCRIPTION OF CHANGE ATTACHMENT(S) YES NO

First why, then how.

The Contract Time is proposed to be [~~increased/decreased~~ **unchanged**] by ____ days. Otherwise, parties agree by checking here ; that the time of consideration of this MCR, there is no agreement on adjustment of the Contract Time. The Contractor, without prejudice and without waiving any rights to such claim for adjustment to Contract Time in relation to these MCR(s), agrees to postpone claim in accordance with Paragraph 7.3 of the General Conditions.



Invitation to Bid No. _____
APS Contract No. _____

OWNER REVIEW OF CONTENT AND/OR FEASIBILITY

- DO NOT PROCEED
- PROCEED WITH ESTIMATE OF COSTS ONLY (within 10 calendar days of receipt of this MCR)!
- PROCEED WITH WORK, ESTIMATES OF COSTS TO FOLLOW (estimate within 10 days of receipt of this MCR)!

Authorized APS Representative Date

A/E-ESTIMATED COST OF REQUIRED DESIGN WORK: (estimated within 5 days; Include breakdown of costs)

\$ _____ Initial _____
Project DP Date

PROCEED WITH DESIGN: (Forward proposed costs of work to OWNER for approval, include GRT)

APPROVED AMOUNT \$ _____ Initial _____ For APS: _____
Date

CONTRACTORS PROPOSED COST: (Include backup, include GRT)

MCR Cost \$ _____
NMGR @ _____ % \$ _____
APPROVED AMOUNT \$ _____ Initial _____ For APS: _____
Date

MUST BE COMPLETED TO FINALIZE:

- PROCEED WITH MODIFICATION OF WORK AND TO CONTRACT SUM (INCLUDE IN CHANGE ORDER)
- REJECTED BUT REPLACED BY MCR# _____
- REJECTED – STOP ALL ACTION ON THIS REQUEST _____



Invitation to Bid No. _____
 APS Contract No. _____

EXHIBIT D-2
CHANGE ORDER

Albuquerque Public Schools
 PROJECT: _____
 DATE: _____

Distribution to:
 Contractor
 Design Professional
 APS FDC
 APS Procurement
 Other

CHANGE ORDER NO: _____

CONTRACTOR: _____

NOT VALID UNTIL SIGNED BY ALBUQUERQUE PUBLIC SCHOOLS. Signature of the Contractor indicates agreement herewith, including any adjustment in the Contract Sum or Contract Time.

The Original Contract Sum was\$
 Net change by previously authorized Change Orders\$
 The Contract Sum prior to this Change Order was\$
 The Contract Sum will be increased/decreased/unchanged
 by this Change Order in the amount of\$
 The new Contract Sum including this Change Order will be\$

The Contract Time will be increased/decreased/unchanged by _____ days
 The date of Substantial Completion as of the date of this Change Order therefore is

Otherwise, Parties agree by checking here : that at the time of this Change Order, there is no agreement on adjustment to the Contract Time related to MCR(s) [list by MCR number] . The Contractor, without prejudice and without waiving any rights to such claim for adjustment to Contract Time in relation these MCR(s), agrees to postpone claim in accordance with Paragraph 7.3 of the General Conditions.

This CHANGE ORDER encompasses the following:

MCR #	SHORT DESCRIPTION	DISTRICT AMOUNT
SUBTOTAL		
NMGRT	INDICATE TAX RATE AS A %:	
	TOTAL	

By: _____ Karen Alarid, Director APS FDC ALBUQUERQUE PUBLIC SCHOOLS Date: _____	By: _____ Date: _____	By: _____ Date: _____
--	------------------------------	------------------------------



EXHIBIT E
CERTIFICATE OF SUBSTANTIAL COMPLETION

CONTRACT DATED:

PROJECT NAME:

WORK SUBSTANTIALY COMPLETE: (Clearly state if Substantial Completion is WHOLE OR PART)

SUBSTANTIAL COMPLETION is defined, in accordance with Article 9 of the General Conditions, as the date certified by the Design Professional when all the Work, or portion of the Work, is complete except for minor items so that the Owner can completely occupy or fully utilize the Work for it's intended use.

The Design Professional also certifies that Contractor's Punch List of items to be completed or corrected prior to Final Completion, to the best of the Design Professional's knowledge, information and belief, is accurate and includes as a subset, the Punch List of Close-Out Work, in accordance with Subparagraph 9.10.2 of the General Conditions, as well as, a schedule, in accordance with Subparagraph 9.10.2 of the General Conditions, clearly stating when all Work will be complete and when Final Completion will occur in accordance with the General Conditions. The Design Professional and the Contractor certify that the Contractor has attached any agreed upon modifications or exceptions to Warranties stated in the Contract Documents.

The DESIGN PROFESSIONAL therefore has determined that the Date of Substantial Completion for that Work defined above was _____, 20__.

DESIGN PROFESSIONAL:

By:

Date:

The CONTRACTOR certifies that the above is true and in agreement and to be responsible for any Liquidated Damages due related to Substantial Completion date in accordance with the Contract Documents. The amount due for Liquidated Damages is (say in words) \$_____.

CONTRACTOR:

By:

Date:

The OWNER hereby accepts the above defined Work as being Substantially Complete on said date.

<p>By: _____ Karen Alarid, Director, APS FDC DISTRICT REPRESENTATIVE ALBUQUERQUE PUBLIC SCHOOLS</p> <p>Date: _____</p>	<p>Distribution to:</p> <p><input type="checkbox"/> District Representative</p> <p><input type="checkbox"/> Design Professional of Record</p> <p><input type="checkbox"/> APS Procurement</p> <p><input type="checkbox"/> Other</p>
--	---



EXHIBIT F
CERTIFICATE OF FINAL COMPLETION

CONTRACT DATED:

PROJECT NAME:

SUBSTANTIAL COMPLETION DATE:

FINAL COMPLETION is defined, in accordance with Article 9 of the General Conditions, as the date certified by the Design Professional when all the Work of the Project is fully complete, the Close-Out requirements of Paragraph 9.10 of the General Conditions have been completed, including the Close-Out Meeting and approval of Close-Out by the Design Professional, in accordance with Subparagraph 9.10.2, and the Contract fully performed in accordance with the Contract Documents, and the Contractor entitled to final payment.

The DESIGN PROFESSIONAL has inspected the Work and has determined that the Date of Final Completion _____, 20__ was

DESIGN PROFESSIONAL:

By:

Date:

ONE YEAR INSPECTION: Approximately thirty days prior to _____, the one-year anniversary of the Date of Substantial Completion, the Design Professional, the Owner, and the Contractor shall conduct an inspection of the Project to determine any correction of the Work which may be required at that time.

The CONTRACTOR certifies that the Work is fully completed and was completed on or before _____, and submits herewith:

Application for Final Payment (AIA G702, or equal)
Affidavit of Payments (AIA G706, or equal)
Consent of Surety (AIA G707, or equal)
Release of Liens (AIA G706A, or equal)

CONTRACTOR:

By:

Date:

The OWNER hereby accepts the Work as fully complete and will make final payment.

<p>By: _____ Karen Alarid, Director, APS FDC DISTRICT REPRESENTATIVE ALBUQUERQUE PUBLIC SCHOOLS</p> <p>Date: _____</p>	<p>Distribution to:</p> <p><input type="checkbox"/> District Purchasing Agent <input type="checkbox"/> Design Professional <input type="checkbox"/> APS Procurement <input type="checkbox"/> Other</p>
--	--



EXHIBIT G – APS PROJECT MANAGEMENT SYSTEM

ELECTRONIC DATA REQUIREMENTS

General Requirements:

- a. The Contractor shall provide at a minimum, the following to its staff:
 - i. **Computer:** Minimum Intel Pentium® 4 Processor 2.4 GHz or equivalent processor with 512 MB of RAM; recommended Centrino Duo® Processors 1.6 GHz or equivalent with 2GB or RAM, or higher.
 - ii. **Computer Operating System:** Windows XP, Windows Vista, or Windows 7
 - iii. **Web Browser:** Microsoft Internet Explorer 9
 - iv. **Work and Spreadsheet Processors:** Microsoft Office Word, Excel and Outlook
 - v. **Scheduling Software:** Microsoft Project or Primavera
 - vi. **Internet Service Provider:** A reliable ISP in the area of the Project
 - vii. **Connection Speed/Minimum Bandwidth:** DSL, ADSL, or T1 Line for transferring a minimum of 3Mbps Downstream and 512 Kbps Upstream
 - viii. **Have or install a scanner minimum 800 x 600 pixels, and a digital camera minimum resolution of one (1) megapixel.**
- b. Contractor shall provide its management personnel assigned to this Project with access to personal computers and the Internet on a daily basis.

Project Web Requirements:

- a. This project will utilize a web based project management tool called e-Builder Enterprise™. This web based application is a collaboration tool, which will allow project team members continuous access through the Internet to important project data as well as up to the minute decision and approval status information.
- b. Contractor shall have the responsibility for visiting the Project web site on a daily basis, and as necessary to be kept fully apprised of the Project developments, for correspondence, assigned tasks and other matters that transpire on the site. These may include but are not limited to: Contracts, Contract Exhibits, Contract Amendments, Drawing Issuances, Addenda, Bulletins, Permits, Insurance & Bonds, Safety Program Procedures, Safety Notices, Accident Reports, Personnel Injury Reports, Schedules, Site Logistics, Progress Reports, Daily Logs, Non-Conformance Notices, Quality Control Notices, Punch Lists, Meeting Minutes, Requests for Information, Submittal Packages, Substitution Requests, Monthly Payment Request Applications, Supplemental Instructions, Owner Variation Directives, Potential Variation Orders, Variation Order Requests, Variation Orders, and the like. All supporting data including but not limited to shop drawings, product data sheets, manufacturer data sheets and instructions, method statements, safety MSDS sheets, Substitution Requests and the like will be submitted in digital format via e-Builder Enterprise™.

Electronic File Requirements:

- a. In addition to the standard closeout submittal requirements detailed elsewhere in the Contract Documents, the Contractor shall also submit all closeout documents including “As-Built Drawings”, catalog cuts and Owner’s Operation and Maintenance manuals in digital format. All documents (including as-built drawings) shall be converted or scanned into the Adobe Acrobat (.pdf) file format and uploaded to e-Builder Enterprise™.

e-Builder Enterprise™ User Licenses:

The Contractor is required to purchase and maintain for the life of the project at least one annual e-Builder Enterprise™ user license as part of basic services. e-Builder Inc. will facilitate user license acquisition.

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. BE-20-0183-B, dated 01/28/20

DOCUMENTS FOLLOW



LABOR RELATIONS DIVISION

401 Broadway NE
Albuquerque, NM 87102
Phone: 505-841-4400
Fax: 505-841-4424

226 South Alameda Blvd
Las Cruces, NM 88005
Phone: 575-524-6195
Fax: 575-524-6194

WWW.DWS.STATE.NM.US

1596 Pacheco St, Suite 103
Santa Fe, NM 87505
Phone: 505-827-6817
Fax: 505-827-9676

Wage Decision Approval Summary

1) Project Title: Ernie Pyle MS- Re Roof & HVAC Replacement
Requested Date: 01/27/2020
Approved Date: 01/28/2020
Approved Wage Decision Number: BE-20-0183-B

Wage Decision Expiration Date for Bids: 05/27/2020

2) Physical Location of Jobsite for Project:
Job Site Address: 1820 Valdora Rd SW
Job Site City: Albuquerque
Job Site County: Bernalillo

3) Contracting Agency Name (Department or Bureau): Albuquerque Public Schools
Contracting Agency Contact's Name: Ben Harris
Contracting Agency Contact's Phone: (505) 848-8708 Ext.

4) Estimated Contract Award Date: 02/17/2020

5) Estimated total project cost: \$1,400,000.00

a. Are any federal funds involved?: No

b. Does this project involve a building?: Yes - The main school building will have the old, existing roof system removed down to the deck and replaced with a 5 ply BUR. The existing evaporative cooling system will demo'd and replaced with refrigerated air. Plumbing and electrical upgrades will be made to accommodate the new HVAC system.

c. Is this part of a larger plan for construction on or appurtenant to the property that is subject to this project?: No

d. Are there any other Public Works Wage Decisions related to this project?: No

e. What is the ultimate purpose or functional use of the construction once it is completed?: To provide a new, water-tight roof system and a new HVAC cooling system to provide adequate cooling to all classrooms and support spaces.

6) Classifications of Construction:

Classification Type and Cost Total	Description
General Building (B) Cost: \$1,400,000.00	Re-roof and HVAC replacement at the existing main school building.



PUBLIC WORKS PROJECT REQUIREMENTS

As a participant in a Public Works project valued at more than \$60,000 in the state of New Mexico, the following list addresses many of the responsibilities that are defined by statute or regulation to each project stakeholder.

Contracting Agency

- Ensure that all contractors wishing to bid on a Public Works project when the project is \$60,000 or more are actively registered with the Public Works and Apprenticeship Application (PWAA) website: <http://www.dws.state.nm.us/pwaa> (Contractor Registration) prior to bidding.
- Please submit Notice of Award (NOA) and Subcontractor List(s) to the PWAA website promptly after the project is awarded.
- Please update the Subcontractor List(s) on the PWAA website whenever changes occur.
- All sub-contractors and tiers (excluding professional services) regardless of contract amount must be listed on the Subcontractor List and must adhere to the Public Works Minimum Wage Act.
- Ninety days after project completion please go into the PWAA system and close the project. Only contracting agencies are allowed to close the project. Agents or contractors are not allowed to close projects.

General Contractor

- Provide a complete Subcontractor List and Statements of Intent (SOI) to Pay Prevailing Wages for all contractors, regardless of amount of work, to the contracting agency within 3 (three) days of award.
- Ensure that all subcontractors wishing to bid on a Public Works project have an active Contractor Registration with the Public Works and Apprenticeship Application (PWAA) website: <http://www.dws.state.nm.us/pwaa> prior to bidding when their bid will exceed \$60,000.
- Make certain the Public Works Apprentice and Training Act contributions are paid either to an approved Apprenticeship Program or to the Public Works Apprentice and Training Fund.
- Confirm the Wage Rate poster, provided in PWAA, is displayed at the job site in an easily accessible place.
- When the project has been completed, make sure the Affidavits of Wages Paid (AWP) are sent to the contracting agency.
- All subcontractors and tiers (excluding professional services) regardless of contract amount must pay prevailing wages, be listed on the Subcontractor List, and adhere to the Public Works Minimum Wage Act.



LABOR RELATIONS DIVISION
121 Tijeras Ave NE, Suite 3000
Albuquerque, NM 87102
Phone: 505-841-4400
Fax: 505-841-4424

WWW.DWS.STATE.NM.US

Subcontractor

- Ensure that all subcontractors wishing to bid on a Public Works project have an active Contractor Registration with the Public Works and Apprenticeship Application (PWAA) website: <http://www.dws.state.nm.us/pwaa> prior to bidding when their bid will exceed \$60,000.
- Make certain the Public Works Apprentice and Training Act contributions are paid either to an approved Apprenticeship Program or to the Public Works Apprentice and Training Fund.
- All subcontractors and tiers (excluding professional services) regardless of contract amount must pay prevailing wages, be listed on the Subcontractor List, and adhere to the Public Works Minimum Wage Act.

Additional Information

Reference material and forms may be found in the New Mexico Department of Workforce Solutions Public Works web pages at: <https://www.dws.state.nm.us/Labor-Relations/Labor-Information/Public-Works>.

CONTACT INFORMATION

Contact the Labor Relations Division for any questions relating to Public Works projects by email at public.works@state.nm.us or call (505) 841-4400.



TYPE “B” – GENERAL BUILDING

Effective January 1, 2020

Trade Classification	Base Rate	Fringe Rate	Apprenticeship
Asbestos Workers/Heat and Frost insulators	32.26	12.06	0.60
Asbestos Workers/Heat and Frost insulators-Los Alamos County	34.69	12.06	0.60
Boilermaker/ blacksmith	34.97	28.85	0.60
Bricklayer/Block layer/Stonemason	24.46	8.81	0.60
Carpenter/Lather	24.63	11.24	0.60
Carpenter-Los Alamos County	27.80	13.19	0.60
Millwright/ pile driver	33.16	25.24	0.60
Cement Mason	21.07	10.33	0.60
Electricians-Outside Classifications-Zone 1			
Ground man	23.27	12.67	0.60
Equipment Operator	33.39	15.35	0.60
Lineman/Tech	39.28	16.91	0.60
Cable Splicer	43.21	17.95	0.60
Electricians-Outside Classification: Zone 2			
Ground man	23.27	12.67	0.60
Equipment Operator	33.39	15.35	0.60
Lineman/ technician	39.28	16.91	0.60
Cable Splicer	43.21	17.95	0.60



Electricians-Outside Classifications: Los Alamos			
Ground man	23.94	12.85	0.60
Equipment Operator	34.35	15.60	0.60
Lineman/ Technician	40.41	17.21	0.60
Cable Splicer	44.45	18.28	0.60
Electricians-Inside Classifications: Zone 1			
Wireman/ low voltage technician	32.70	11.18	0.60
Cable Splicer	35.97	11.28	0.60
Electricians-Inside Classification: Zone 2			
Wireman/ low voltage technician	35.64	11.27	0.60
Cable Splicer	38.91	11.37	0.60
Electricians-Inside Classification: Zone 3			
Wireman/ low voltage technician	37.61	11.33	0.60
Cable Splicer	40.88	11.43	0.60
Electricians-Inside Classification: Zone 4			
Wireman/ low voltage technician	41.20	11.44	0.60
Cable Splicer	44.47	11.53	0.60
Electricians-Inside Classification: Los Alamos			
Wireman/ low voltage technician	37.61	13.21	0.60
Cable Splicer	40.88	13.47	0.60
Elevator Constructor	43.80	35.25	0.60
Elevator Constructor Helper	35.04	35.25	0.60
Glazier			
Journeyman/ Fabricator	20.25	5.35	0.60



Delivery Driver	9.00	5.35	0.60
Ironworker	27.00	15.75	0.60
Painter (Brush/Roller/Spray)	17.00	6.88	0.60
Paper Hanger	17.00	6.88	0.60
Drywall- Light Commercial & Residential			
Ames tool operator	25.08	7.10	0.60
Hand finisher/machine texture	24.08	7.10	0.60
Plasterer	23.17	8.99	0.60
Plumber/Pipefitter	30.76	11.62	0.60
Roofer	25.23	7.97	0.60
Sheet metal worker			
Zone 1	31.03	17.26	.60
Zone 2 – Industrial	32.03	17.26	.60
Zone 3 – Los Alamos	33.03	17.26	.60
Soft Floor Layer	19.94	17.26	0.60
Sprinkler Fitter	30.90	22.29	0.60
Tile Setter	24.46	8.81	0.60
Tile Setter Helper/Finisher	16.53	8.81	0.60
Laborers			
Group I- Unskilled and semi-skilled	17.50	6.27	0.60
Group II- Skilled	18.50	6.27	0.60
Group III- Specialty	20.75	6.27	0.60
Masonry Laborers			
Group I- Unskilled and Semi-Skilled	18.00	6.27	0.60
Group II- Skilled	19.75	6.27	0.60
Group III- Specialty	20.25	6.27	0.60
Reinforcing iron workers and post tension	24.00	6.27	0.60



Operators			
Group I	20.95	7.27	0.60
Group II	23.11	7.27	0.60
Group III	23.57	7.27	0.60
Group IV	24.01	7.27	0.60
Group V	24.20	7.27	0.60
Group VI	24.41	7.27	0.60
Group VII	24.52	7.27	0.60
Group VIII	27.56	7.27	0.60
Group IX	29.95	7.27	0.60
Group X	33.35	7.27	0.60
Truck Drivers			
Group I-VII	16.45	7.87	0.60
Group VIII	16.51	7.87	0.60
Group IX	18.45	7.87	0.60

NOTE: All contractors are required to pay SUBSISTENCE, ZONE AND INCENTIVE PAY according to the particular trade. Details are located in a PDF attachment at WWW.DWS.STATE.NM.US. Search Labor Relations/Labor Information/Public Works/Prevalling Wage Rates.

For more information about the Subsistence, Zone, and Incentive Pay rates, or to file a wage claim, contact the Labor Relations Division at (505) 841-4400 or visit us online at www.dws.state.nm.us.

GENERAL CONDITIONS

The General Conditions of this Contract are incorporated in the standard agreement.

A sample Agreement is previously attached (see 00 5000).

DOCUMENT FOLLOWS

00 7000-1

ALBUQUERQUE PUBLIC SCHOOLS

General Conditions of the Contract for Construction

2008 Edition rev. 1

TABLE OF ARTICLES

1. GENERAL PROVISIONS
2. OWNER
3. CONTRACTOR
4. ADMINISTRATION OF THE CONTRACT
5. SUBCONTRACTS
6. CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
7. CHANGES IN THE WORK
8. TIME
9. PAYMENTS AND COMPLETION
10. PROTECTION OF PERSONS AND PROPERTY
11. INSURANCE AND BONDS
12. UNCOVERING AND CORRECTION OF WORK
13. MISCELLANEOUS PROVISIONS
14. TERMINATION OR SUSPENSION OF THE CONTRACT



INDEX

Acceptance of Nonconforming Work 9.6.6, 9.9.3, 12.3	Award of Subcontracts and Other Contracts for Portions of the Work 5.2
Acceptance of Work 9.6.6, 9.8.2, 9.9.3, 9.10, 12.3	Basic Definitions 1.1
Access to Work 3.16 , 6.2.1, 12.1	Bid Clarification of Construction Documents 1.2.1
Accident Prevention 3.3, 4.2.2, 10	Bidding Requirements 1.1.1, 1.1.7, 5.2.1, 11.5.1
Acts and Omissions 3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 4.3.8, 4.4.1, 8.3.1, 9.5.1, 10.2.5, 13.4.2, 13.7, 14.1	Boiler and Machinery Insurance 11.4.2
Addenda 1.1.1, 3.11	Bonds, Performance and Payment 9.6.7, 9.10.3, 9.11.2.6, 11.4.9, 11.5
Additional Costs, Claims for 4.3.4, 4.3.5, 4.3.6, 6.1.1, 10.3	Bribes, Gratuities and Kickbacks 3.1.6
Additional Inspections and Testing 9.8.3, 12.2.1, 13.5	Building Permit 3.7.1, 3.7.2
Additional Time, Claims for 4.3.4, 4.3.6, 4.3.7, 7.2, 7.3, 8.3.2, 8.3.3	Capitalization 1.3
Administration of the Contract 3.1.3, 4 , 9.4, 9.5	Certificate of Substantial Completion 9.8.3, 9.8.4, 9.8.5
Advertisement or invitation to Bid 1.1.1	Certificates for Payment 4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7.1, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4
Aesthetic Effect 4.5.1	Certificates for Payment, Owner Cut-Off Time 9.4.1
Allowable Costs and Fees (Change Orders) 7.2.5	Certificates of Inspection, Testing or Approval 13.5.4
Allowances 3.8	Certificates of Insurance 9.10.2, 11.1.3
Antitrust Claims, Assignment of 3.1.7	Change Orders (see Modification / Change Request) 1.1.1, 2.4.1, 3.4.2, 3.8.2.3, 3.11.1, 3.12.8, 4.2.8, 4.3.4, 4.3.9, 5.2.3, 7.1, 7.2.11, 7.3 , 8.3.1, 9.3.11, 9.10.3, 11.4.1.2.11.4.4, 11.4.9, 12.1.2
Applications for Payment 4.2.5, 9.2, 9.3 , 9.4 , 9.5 , 9.6.3, 9.7.1, 9.8.5, 9.10, 11.1.3, 14.2.4, 14.4.3	Change Orders, Definition of 7.3
Approvals 2.4, 3.1.3, 3.5, 3.10.2, 3.12, 4.2.7, 9.3.2, 9.8.4, 11.1, 13.4.2, 13.5	Changes in the Work 3.11, 4.2.8, 7 , 8.3.1, 9.2.1.1, 11.4.9
Arbitration 4.4.1, 4.4.4.6, 4.5.1, 4.5.2, 4.6 , 8.3.1, 11.4.9	Changes, Modification / Change Request 7.2
Asbestos 10.3.1	Changes, Allowable Costs 7.2.5 , 7.2.5.1, 7.2.6
As-Builts (see also Record Drawings) 9.3.3 9.4.2, 9.10.1.6, 9.10.1.7	Claim, Definition of 4.3.1
Attorneys' Fees 3.18.1	Claims and Disputes 3.2.3, 4.3 , 4.4, 4.6, 6.1.1, 6.3.7, 9.3.3, 9.10.4, 10.3.3
Audit 7.2.5.2	Claims, Time limits on 4.3.2, 4.3.4
Award of Separate Contracts 6.1.1, 6.1.2	Claims and timely Assertion of Claims 4.3.2, 4.6.4



01-30-09

INVITATION TO BID NO.: _____
APS CONTRACT NO.: _____

Claims for Additional Cost 3.2.3, 4.3.4, 4.3.5 , 4.3.6, 6.1.1, , 10.3.2	Change directives, MCR 7.2.4
Claims or Additional Time 3.2.3, 4.3.4, 4.3.7 , 6.1.1, 8.3.2, 8.3.3, 10.3.2	Construction schedules, Contractor's 1.4.1.2, 3.10, 3.12.1, 3.12.2, 4.3.7.2, 6.1.3, 9.8.6
Claims for Concealed or Unknown Conditions 4.3.4	Contingent Assignment of Subcontracts 5.4 , 14.2.2.2
Claims for Damages 3.2.3, 3.18, 4.3.10, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 11.1.1, 11.11.4.7, 14.1.3, 14.2.4	Continuing Contract Performance 4.3.3
Claims Subject to Arbitration 4.4.1, 4.5.1, 4.6.1	Contract, definition of 1.1.2
Cleaning Up 3.13.17, 3.15 , 6.3	Contract, Termination or suspension of the 5.4.1.1, 11.4.9, 14
Close-Out 1.1.8, 2.4.2, 3.11.2, 9.2.2, 9.8.2, 9.10	Contract Administration 3.1.3, 4, 9.5
Commencement of Statutory Limitation Period 13.7	Contract Award and Execution, Conditions Relating to 3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.4.6, 11.5.1
Commencement of the Work, Conditions Relating to 2.2.1, 3.2.1, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 4.3.5, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.4.1, 11.4.6, 11.5.1	Contract documents, The 1.1 , 1.2
Commencement of the Work, Definition of 8.1.2	Contract Documents, Copies Furnished and use of 1.6, 2.2.5, 5.3
Communications Facilitating Contract Administration 3.9.1, 4.2.4	Contract documents, definition of 1.1.1
Communications, Language 4.2.4.2	Contract documents, Intent of 1.2
Completions, Conditions Relating to 1.6.1, 3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 13.7, 14.1.2	Contract Sum 3.8, 4.3.4, 4.3.5, 4.4.5, 5.2.3, 7.2, 7.3, 7.4, 9.1 , 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.4.1, 14.2.4, 14.3.2
Completion, payments and 9	Contract Sum, Definition of 9.1
Completion, Substantial 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8 , 9.9, 9.10, 9.11.3, 12.2, 13.7, 14.7	Contract Time 4.3.4, 4.3.7, 4.5.2.3, 7.2.1.3, 7.3.7.4, 8.1.1, 8.2, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 14.3.2
Compliance with Laws 1.6.1, 3.1, 3.2.2, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 4.6.4, 4.6.6, 9.6.4, 10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1, 14.2.1.3	Contract Time, Definition of 8.1.1
Concealed or Unknown Conditions 4.3.4, 8.3.1, 10.3	Contractor 3
Condition of the Contract 1.1.1, 1.1.7, 6.1.1, 6.1.4	Contractor, definition of 3.1, 6.1.2
Consent Written 1.6, 6.4.2, 3.12.8, 3.14.2, 4.1.2, 4.3.4, 4.6.4, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2	Contractor's Construction Schedules 2.4.3, 3.7.2, 3.10 , 3.12, 4.3.7.2, 6.1.3
Construction by Owner or by Separate Contractors 1.1.4, 6	Contractor's Construction Schedule - Accelerated 6.1.3
Construction Change Directive, definition of 7.2.4	Contractor's Employees 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.4.7, 13.8, 14.1, 14.2.1.1
	Contractor's Liability Insurance 11.1
	Contractor Licensing 3.1.4 , 3.19.1.3
	Contractor Logs and Reports 3.10 , 4.2.4.1



Contractor's Relationship with Separate Contractors and Owner's forces
3.12.5, 3.14.2, 4.2.4, 6, 11.4.7, 1 12.2.4

Contractor's Relationship with Subcontractors
1.2.2, 3.3.2, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2, 11.4.1.2, 11.4.7, 11.4.8

Contractor's Relationships, Bound Conditions
5.3

Contractor's Relationship with the Design Professional
1.1.2, 1.6, 3.1.3, 3.2.1, 3.2.2, 3.2.3, 3.3.1, 3.4.2, .5.1, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.1.3, 4.2, 4.3.4, 4.4.1, 4.4.7, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 11.4.7, 12, 13.4.2, 13.5

Contractor's Representations
1.5.2, 3.5.1, 3.12.6, 3.19, 6.2.2, 8.2.1, 9.3.3, 9.8.2

Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.3, 4.3.8, 5.3.1, 6.1.3, 6.2, 6.3, 9.5.1, 10

Contractor's Review of Contract Documents
1.5.2, 3.2, 3.19

Contractor's Right to Stop the Work
9.7, 13.4.3

Contractor's Right to Terminate the Contract
4.3.10, 14.1

Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.5.2

Contractor's Superintendent
3.9, 10.2.6

Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 4.3.3, 6.1.3, 6.2.4, 7.1.3, 8.2, 10, 12, 14

Contractual Liability Insurance
11.1.1.8, 11.2, 11.3

Coordination and Correlation
1.2, 1.5.2, 3.3.1, 3.10, 3.12.3, 6.1.3, 6.2.1

Copies Furnished of Drawings and Specifications
1.6, 2.2.5, 3.11

Copyrights
1.6, 3.17

Correction Period, 11th month inspection
12.2.6

Correction of Work
2.3, 2.4, 3.7.4, 4.2.1, 9.4.2, 9.8.2, 9.9.1, 1 12.2, 13.7.1.3

Correlation and Intent of the Contract Documents
1.2

Costs
2.4, 3.2.3, 3.7.4, 3.8.2, 3.15.2, 4.3, 5.4.2, 6.1.1, 6.2.3, 9.10.2, 10.3.2, 10.5, 11.3, 11.4, 12.1, 12.2.1, 12.2.1, 13.5, 14

Cutting and Patching
6.2.5, 3.14

Damage to Construction of Owner or Separate Contractors
3.1.2, 6.2.4, 9.2.1.5, 10. 10.2.5, 10.6, 11.1, 11.4, 12.2.1

Damage to the Work
3.14.2, 9.9.1, 10. 10.2.5, 10.6, 11.4, 12.2.4

Damages, Claims for
3.2.3, 3.18, 4.3.10, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 11.1.1, 11. 11.4.7, 14.1.3, 14.2.4

Damages for delay
6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2

Date of Commencement of the Work, Definition of
8.1.2

Date of Substantial Completion, Definition of
8.1.3

Day, Definition of
8.1.4

Debarred or Suspended Contractors
3.1.5

Decisions of the Design Professional
4.2.6, 4.2.7, 4.2.11, 4.3.4, 4.4.1, 4. 4.4.6, 6.3, 8.1.3, 8.3.4, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4

Decisions to Withhold Certification
9.4.1, 9.5, 9.7, 14.1.1.3

Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.3, 2.4, 3.5.1, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1, 13.7.1.3

Defective Work, Definition of
3.5.1

Definitions
1.1, 2.1.1, 3.1, 3.5.1, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 4.3.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1

Delays and Extensions of Time
3.2.3, 4.3.1, 4.3.4, 4.3.7, 4. 5.2.3, 7.2.1, 7.3.1, 7.4.1, 7.5.1, 8.3, 9.5.1, 9.7.1, 10.3.2, 10.6.1, 14.3.2

Design Performance
3.12.11

Design Professional
4.1

Design Professional, Definition of
4.1.1

Design Professional, Extent of Authority
2.4, 3.12.7, 4.2, 4.3.6, 4.4, 5.2, 6.3, 7.1.2, 7.4, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.4, 5.2.1, 7.4, 9.4.2, 9.6.4, 9.6.6



Design Professional's Additional Services and Expenses
2.4, 12.2.1, 13.5.2, 13.5.3, 14.2.4

Design Professional's Administration of the Contract
3.1.3, 4.2, 4.3.4, 4.4, 9.4, 9.5

Design Professional's Approvals
2.4, 3.1.3, 3.5.1, 3.10.2, 4.2.7

Design Professional's Authority to Reject Work
3.5.1, 4.2.6, 1 12.2.1

Design Professional's Decisions
4.2.6, 4.2.7, 4.2.11, 4.3.4, 4.4.1, 4.4.5 4.4.6, 6.3, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4

Design Professional's Inspections
4.2.2, 4.2.9, 4.3.4, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.5

Design Professional's Instructions
3.2.3, 3.3.1, 4.2.6, 4.2.7, 4.2.8, 7.4.1, 12.1, 13.5.2

Design Professional's Interpretations
4.2.11, 4.3.6

Design Professional's Project Representative
4.2.10

Design Professional's Relationship with Contractor
1.1.2, 1.6, 3.1.3, 3.2.1, 3.2.2, 3.2.3, 3.3.1, 3.4.2, 3.5.1, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.1.3, 4.2, 4.3.4, 4.4.1, 4.4.7, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 11.4.7, 12, 13.4.2, 13.5

Design Professional's Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.4.7

Design Professional's Representations
9.4.2, 9.5.1, 9.10.1

Design Professional's Site visits
4.2.2, 4.2.5, 4.2.9, 4.3.4, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5

Disputes
4.1.4, 4.3, 4.4, 4.6, 6.3, 7.2.8, 7.2.9, 7.3.1, 13.4.3

Documents and Samples at the Site
3.11

Drawings, Definition of
1.1.5

Drawings and Specifications, Use and Ownership of
1.1.1, 1.2.5, 1.3, 2.2.5, 3.11, 5.3

Effective date of Insurance
8.2.2, 11.1.2

Emergencies
3.10.4, 4.3.5, 10.6, 14.1.1.2

Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.4.7, 13.8, 14.1, 14.2.1.1

Equipment, Labor, Materials, and
1.1.3, 1.1.6, 3.4, 3.5.1, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.2

Existing Work, Protection and Repairing
3.13.19, 10

Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2.5, 3.1, 3.3, 3.4, 3.5, 3.7, 3.10, 3.12, 3.14, 4.2.2, 4.2.3, 4.3.3, 6.2.2, 7.1.3, 8.2, 9.5, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3

Extension of Time
3.2.3, 4.3.1, 4.3.4, 4.3.7, 4.5.2.3, 7.2.1, 7.3, 7.4.1, 9.5.1 9.7.1, 10.3.2, 10.6.1, 14.3.2

Failure of Payment
4.3.6, 9.5.1.3, 9.7, 9.10.2, 14.1.1.3, 14.13.6

Faulty Work
(See Defective or Nonconforming Work)

Field Office
3.11, 3.13.7, 3.13.8

Final Completion and Final Payment
4.2.1, 4.2.9, 4.3.2, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 11.12.3.1, 13.7, 14.2.4, 14.3

Financial Arrangements, Owner's
2.2.1, 13.2.2

Fire and Extended Coverage Insurance
11.4

General Provisions
1

Governing Law
13.1

Gross Receipts Tax, Nonresident Contractor's Surety Bond Requirement
3.1.7

Gross Receipts Tax Registration
3.6.2

Guarantees (See Warranty)

Hazardous Materials
10.2.4, 10.3, 10.5

Inconsistencies
1.2.5, 3.2.1, 3.2.3

Identification of Subcontractors and suppliers
5.2.1

Indemnification
3.18, 9.11.2, 10.3.2, 11.4.1.2, 11.4.7

Information and services Required of the Owner
2.2, 2.1, 3.12, 3.12.10, 4.2.7, 4.3.3, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.9.2, 9.10.3, 1.2, 11.4, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4

Injury or Damage to Person or Property
4.3.8, 10.2, 10.6



Inspections3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2,
9.8.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.5**Instructions to Bidders**

1.1.1

Instructions to the Contractor3.2.3, 3.3.1, 3.8.1, 4.2.8, 5.2.1, 7, 12, 7.2.2,
13.5.2**Insurance**3.18.1, 6.1.1, 8.2.1, 9.3.2, 9.8.4, 9.9.1, 9.10.2,
3.10.5, 11**Insurance, Boiler and Machinery**

11.4.2

Insurance, Contractor's Liability

11.1

Insurance, Effective Date of

8.2.2, 11.1.2

Insurance Loss of Use

11.4.3

Insurance, Owner's Liability

11.2

Insurance Property

10.2.5, 11.4

Insurance, Stored Materials

9.3.2, 11.4.1.2

Insurance and Bonds

11

Insurance Companies, Consent to Partial Occupancy

9.9.1, 11.4.1.5

Insurance Companies, Settlement with

11.4.10

Intent of the Contract Documents

1.2, 4.2.7, 7.4, 12.2.6

Interest

13.6

Interpretation

1.2.3, 1.4, 4.1.1, 4.3.1, 5.1, 6.1.2, 8.1.4

Interpretation, Written

4.2.11, 4.3.6

Joiner and Consolidation of Claims Required

4.6.4

Judgment on Final Award

4.6.6

Labor and Materials, Equipment1.1.3, 1.1.3, 3.4, 3.5.1, 3.8.2, 3.8.3, 3.12, 3.13,
3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 9.3.2, 9.3.3,
9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.2**Labor Disputes**

8.3.1

Laws and Regulations1.6, 3.2.2, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 4.6,
9.6.4, 9.9.1, 10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1,
13.5.2, 13.6, 14**Limitations on Consolidation or Joiner**

4.6.4

Limitations, statutes of

4.6.3, 12.2.6, 13.7

Limitations of Liability2.3, 3.2.1, 3.5.1, 3.12.8, 3.12.10, 3.17, 3.18,
4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.10.4,
10.2.5, 11.1.2, 11.2.1, 11.4.7, 12.2.5, 13.4.2**Limitations of Time**2.2, 2.4, 3.2.1, 3.10, 3.11, 3.12.5, 3.15.1,
4.2.7, 4.3, 4.4, 4.6, 5.2, 5.3, 5.4, 6.2.4, 7.3,
7.4, 8.2, 9.2, 9.3.1, 9.3.3, 4.1, 9.5, 9.6, 9.7,
9.8, 9.9, 9.10, 11.1.3, 11.4.1.5, 11.4.6, 11.4.10,
12.2, 13.5, 13.7, 14**Liquidated Damages**

4.3.10, 8.3, 8.4, 9.5.1, 9.8.7,

Loss of Use Insurance

11.4.3

Material suppliers1.6, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6,
9.10.5**Materials Hazardous**

10.2.4, 10.3, 10.5

Materials, Labor, and Equipment1.1.3, 1.1.6, 1.6.1, 3.4, 3.5.1, 3.8.2, 3.8.2.3,
3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1,
9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.1,
14.2**MCR, Allowable Costs**

7.2.5

Means Methods, Techniques, Sequences and**Procedures of Construction**

3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2

Meetings, Bi-weekly

3.10.3, 3.10.3.1

Minor Changes in the Work

1.1.1, 3.12.8, 4.2.8, 4.3.6, 7.4

Miscellaneous Provisions

13

Modification / Change Request (MCR)

1.1.1, 3.4.2, 7.2, 7.3.1, 9.8.6

Modifications, Definition of

1.1.1

Modifications to the Contract1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1,
9.7, 10.3.2, 11.4.1**Mutual Responsibility**

6.2

Nonconforming Work, Acceptance of

9.6.6, 9.9.3, 12.3

Nonconforming Work, Rejection and Correction of2.3, 2.4, 3.5.1, 4.2.6, 6.2.5, 9.5.1, 9.8.2, 9.9.3,
9.10.4, 12.2.1, 13.7.1.3

Nonresident Contractor's Requirement for Gross Receipts Tax Surety Bond
3.6.5, 3.6.5.1, 3.6.5.2

Nonresident Persons, Partnerships or Un-admitted Foreign Corporations, Contracts with and Agent for Service of Process
3.1.8

Notice
2.2.1, 2.3, 2.4, 3.2.3, 3.3.1, 3.7.2, 3.7.4, 3.12.9, 4.3, 4.6.5, 5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 11.1.3, 11.4.6, 12.2.2, 12.2.4, 13.3, 13.5.1, 13.5.2, 14.1, 14.2

Notice, Written
2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 4.3, 4.6.5, 5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 11.4.6, 12.2.2, 12.2.4, 13.3, 14

Notice of Testing and Inspections
13.5.1, 13.5.2

Notice to Proceed
8.2.2

Notices, Permits, Fees and
2.2.2, 3.7, 3.13, 10.2.2

Observations, Contractor's
1.5.2, 3.2, 4.3.4

Occupancy
2.2.2, 9.6.6, 9.8, 11.4.1.5

Orders, Written
1.1.1, 2.3, 3.9, 4.3.6, 7.8.2.2, 11.4.9, 12.1, 12.2, 13.5.2, 14.3.1

Owner
2

Owner, Definition of
2.1, 2.1.1, 2.1.2

Owner, Information and Services Required of the
2.2, 3.2.1, 3.12.4, 3.12.10, 4.2.7, 4.3.3, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 11.2, 11.4, 13.5.1, 13.5.2, 14.1.1, 14.1.4

Owner's Authority
1.6, 2.1.1, 2.3, 2.4, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.1.3, 4.2.4, 4.2.9, 4.3.6, 4.4.7, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.4.3, 11.4.10, 12.2.2, 12.3.1, 13.2.2, 14.3, 14.4

Owner's Financial Capability
2.2.1, 13.2.2

Owner's Liability Insurance
11.2

Owner's Loss of Use Insurance
11.4.3

Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2

Owner's Right to Carry Out the Work
2.4, 12.2.4, 14.2.2.2

Owner's Right to Clean Up
6.3

Owner's Right to Perform Construction and to Award Separate Contracts
6.1

Owner's right to Stop the Work
2.3

Owner's Right to Suspend the Work
14.3

Owner's Right to Terminate the Contract
14.2

Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.6, 2.2.6, 3.2.1, 3.11.1, 3.17.1, 5.3

Partial Occupancy or Use
9.6.6, 9.9, 11.4.1.5

Patching, Cutting and
3.14, 6.2.5

Patents
3.17

Payment, Application for
4.2.5, 9.2, 9.3, 9.4, 9.5.1, 9.6.3, 9.7.1, 9.8.5, 9.10.1, 9.10.3, 9.10.5, 11.1.3, 14.2.4, 14.4.3

Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7.1, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4

Payment, Failure of
4.3.6, 9.5.1.3, 9.7, 9.10.2, 14.1.1.3, 14.13.6

Payment Final
4.2.1, 4.2.9, 4.3.2, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 11.12.3.1, 13.7, 14.2.4, 14.4.3

Payment Bond, Performance Bond and
9.6.7, 9.10.3, 11.4.9, 11.5

Payments, Progress
4.3.3, 9.3, 9.6, 9.8.5, 9.10.3, 13.6, 14.2.3

Payments and Completion
9

Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 11.4.8, 14.2.1.2

Performance Bond and Payment Bond
9.6.7, 9.10.3, 11.4.9, 11.5

Permits, Fees and Notices
2.2.2, 3.7, 3.13, 10.2.2

Persons and Property, Protection of
10

Polychlorinated Biphenyl
10.3.1

Product Data, Definition of
3.12.2

Product Data and Samples, Shop Drawings
3.11, 3.12, 4.2.7



01-30-09

INVITATION TO BID NO.: _____
APS CONTRACT NO.: _____

Progress and Completion
4.2.2, 4.3.3, **8.2**, 9.8, 9.9.1, 14.1.4

Progress Payments
4.3.3, 9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3

Progress Report (Three-Week-Look-Ahead)
3.10.3.1

Project, Definition of the
1.1.4

Project Management Software
3.1.9, 4.2.4.3

Project Manual, Definition of the
1.1.7

Project Manuals
2.2.5

Project Representatives
4.2.10

Project Schedule
3.10

Property Insurance
10.2.5, **11.4**

Protection of Persons and Property
10

Punch List
1.1.8, 2.4.2, 9.8, 9.10,

Record Drawings
3.8.4, 9.3.3 9.4.2, 9.10.1.6, 9.10.1.7

Reasonably Inferable Work
1.1.3, 1.2.1, **1.2.2**, 4.2.12

Regulations and laws
1.6, 3.2.2, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 4.6,
9.6.4, 9.9.1, 10.2.2, 11.1, 11.4, 13.1, 13.4,
13.5.1, 13.5.2, 13.6, 14

Rejection of Work
3.5.1, 4.2.6, 12.2.1

Releases and Waivers of claims
9.11.2.5

Representations
1.5.2, 3.5.1, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.4.2,
9.5.1, 9.8.2, 9.10.1

Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.10, 5.1.1,
5.1.2, 13.2.1

Resolution of Claims and Disputes
4.4, 4.6

Request for Interpretation (RFI)
3.2.4, 3.10.3

Request for Interpretation, Response time
3.2.4.2

Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.3, 4.3.8, 5.3.1, 6.1.3, 6.2, 6.3,
9.5.1, 10

Review of Contract Documents and Field Conditions
by Contractor
1.5.2, **3.2**, 3.12.7, 6.1.3

Review of Contractor's Submittals by Owner and
Design Professional
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2,
9.8.2

Review of Shop Drawings, Product Data and Samples
by Contractor
3.12

RFI (see Request for Interpretation)

Rights and Remedies
1.1.2, 2.3, 2.4, 3.5.1, 3.15.2, 4.2.6, 4.3.4, 4.6,
5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5,
10.3, 12.2.2, 12.2.4, 13.4, 14

Royalties, Patents and Copyrights
3.17

Rules and Notices for Arbitration
4.6.2, 4.6.5

Safety of Persons and Property
10.2, 10.6

Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3.1, 10.1, 10.2, 10.3

Samples, Definitions of
3.12.3

Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7

Samples at the Site, Documents and
3.11

Schedule of Values
9.2, **9.3.1**

Schedules, Construction
1.4.1.2, **3.10**, 3.12.1, 3.12.2, 4.3.7.2, 6.1.3

Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 4.6.4, 6,
8.3.1, 11.4.7, 1 12.2.5

Schedules Construction
1.4.1.2, 3.10, 3.12.1, 3.12.2 ,4.3.7.2, 6.1.3

Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 4.6.4, 6,
8.3.1, 11.4.7, 1 12.2.5

Shop Drawings, Definition of
3.12.1

Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7

Shop Drawings, Time for Review
3.10.2

Site, Use of
3.13, 6.1.1, 6.2.1

Site, Utility Shut Downs
3.13.3

Site Inspections
1.2.2, 3.2.1, 3.3.3, 3.7.1, 4.2, 4.3.4, **9.4.2**,
9.10.1, 13.5



Site Visits, Design Professional's
4.2.2, 4.2.9, 4.3.4, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5

Special Inspections and Testing
4.2.6, 12.2.1, 13.5

Specification, Definition of the
1.1.6

Specifications, The
1.1.1, **1.1.6**, 1.1.7, 1.2.2, 1.6, 3.11, 3.12.10, 3.17

Statute of Limitations
4.6.3, 12.2.6, 13.7

Stopping the Work
2.3, 4.3.6, 9.7, 10.3, 14.1

Stored Materials
6.2.1, 9.3.2, 10.10.2.4, 11.4.1.2

Subcontractor, Definition of
5.1.1

Subcontractors
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 6.7

Sub contractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10.10.2.1, 11.4.7, 11.4.8, 14.1, 14.2.1, 14.3.2

Submittals
1.6, 3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3, 11.1.3

Submittals, "Piece Meal" delivery of
3.12.4.1

Submittals, Time for review
3.10.2

Subrogation, Waivers of
6.1.1, 11.11.4.7

Substantial Completion
1.1.8, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 9.10.4.2, 12.2, 13.7

Substantial Completion, Definition of
9.8.1

Substitution of Subcontractors
5.2.3, 5.2.4

Substitution of Design Professional
4.1.3

Substitution of Materials
3.4.2, 3.5.1, 3.12.8, 7.2.7

Subsurface Conditions
4.3.4

Successors and Assigns
13.2

Superintendent
3.9, 10.2.6

Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 4.3.3, 6.1.3, 6.2.4, 7.1.3, 8.2, 8.3.1, 9.4.2, 10, 12, 14

Surety
4.4.7, 5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2

Surety, Consent of
9.10.2, 9.10.3

Surveys
2.2.3

Suspension by the Owner for Convenience
14.4

Suspension of the Work
5.4.2, 14.3

Suspension or Termination of the Contract
4.3.6, 5.4.1.1, 11.4.9, 14

Taxes
3.6, 3.8.2.1, 7.2.5, 9.2.1

Temporary Utilities
3.13.2, 3.13.3, 3.13.4, 3.13.5

Temporary Lighting
3.6.3

Termination by the Contractor
3.13.16

Termination by the Owner for Cause
4.3.10, 5.4.1.1, **14.2**

Termination of the Design Professional
4.1.3

Termination of the Contractor
14.2.2

Termination or Suspension of the Contract
14

Tests and Inspections
2.2.4, 3.1.3, 3.3.3, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 11.4.1.1, 12.2.1, 13.5

Time
8

Time, Delays and Extensions of
3.2.3, 4.3.1, 4.4.3, 4.3.7, 4.5.2.3, 7.2.1, 7.3.1, 7.4.1, 7.5.1, **8.3**, 9.5.1, 9.7.1, 10.3.2, 10.6.1, 14.3.2

Time Limits
2.2, 2.4, 3.2.1, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 4.3, 4.4, 4.6, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.4.1.5, 11.4.6, 11.4.10, 12.2, 13.5, 13.7, 14

Time Limits on Claims
4.3.2, 4.3.4, 4.3.8, 4.6

Uncovering and Correction of Work
12

Uncovering of Work
12.1

Unforeseen Conditions
4.3.4, 8.3.1, 10.3



01-30-09

INVITATION TO BID NO.: _____
APS CONTRACT NO.: _____

Unit Prices

4.3.9, 7.2.3

Use of Documents

1.1.1, 1.6, 2.2.5, 3.12.6, 5.3

Use of Site

3.13, 6.1.1.1, 6.2.1

Utilities, Use of

3.13.2, 3.13.3, 3.13.4

Utilities, Removal of temporary

3.13.4

Utility Shutdowns

3.13.6,

Values, Schedule of

9.2, 9.3.1

Waiver of Claims by the Design Professional

13.4.2

Waiver of Claims by the Contractor

4.3.10, 9.10.5, 11.4.7, 13.4.2

Waiver of Claims by the Owner

4.3.10, 9.9.3, 9.10.3, 9.10.4, 11.4.3, 11.11.4.7,
12.2.2.1, 13.4.2, 14.2.4

Waiver of Consequential Damages

4.3.10, 11.4.3,

Waiver of Claims

9.11.2.5

Waivers of Subrogation

6.1.1, 11.11.4.7

Warranty

3.5, 4.2.9, 4.3, 5.3, 9.3.3, **9.8.5**, 9.9.1, 9.10.4,
12.2.2, 12.2.6, 13.7.1.3

Warranty, Extended

9.8.5

Warranty (see also Correction Period)

Weather Delays

3.10.5.2, 3.19.1.5, 4.3.7.2

Work, Definition of

1.1.3

Work, Hours of

3.13.13

Written Consent

1.6, 3.4.2, 3.12.8, 3.14.2, 4.1.2, 4.3.4, 4.6.4,
9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2,
13.4.2

Written Interpretations

4.2.11, 4.3.6

Written Notice

2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 4.3, 4.6.5,
5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 10.3, 11.1.3,
11.4.6, 12.2.2, 12.2.4, **13.3**, 14

Written Orders

1.1.1, 2.3, 3.9, 4.3.6.7, 8.2.2, 11.4.9, 12.1,
12.2, 13.5.2, 14.3.1



ARTICLE 1 GENERAL PROVISIONS**1.1 BASIC DEFINITIONS****1.1.1 THE CONTRACT DOCUMENTS**

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and Addenda issued prior to execution of the Contract, and Modifications.

Modifications are (1) a written amendment to the Contract signed by Owner and Contractor, (2) Modification / Change Request hereinafter referred to as MCR approved by Owner, Contractor and Design Professional, (3) Change Order, or (4) a written order for a minor change in the Work, hereinafter referred to as Supplemental Instruction issued by the Design Professional. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or Invitation to Bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of Addenda relating to bidding requirements).

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Design Professional and Contractor, (2) between the Owner and a Subcontractor, Material Supplier and Equipment Supplier, (3) between the Owner and Design Professional or (4) between any persons or entities other than the Owner and Contractor. The Design Professional shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Design Professional's duties.

1.1.2.1 Each and every provision of law and clause required by law to be inserted in this Contract shall be read and enforced as though it were included herein; and if through error or otherwise any such provision is not inserted, or is not correctly inserted, then upon the written application of either party the Contract shall be amended without cost to make such insertion or correction and that the remainder of this Contract shall remain in effect and not be affected thereby.

1.1.2.2 Counterparts: This Agreement 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. Owner may retain a duplicate copy (e.g. electronic image, photocopy, facsimile) of this Agreement which shall be considered an equivalent to this original.

1.1.3 THE WORK

The term "Work" means the construction and services required by or reasonably inferable from the Contract Documents, whether completed or partially completed, and includes all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the results indicated by the Contract Documents in a safe, expeditious, orderly and workmanlike manner in keeping with current standards of the industry. The Work may constitute the whole or a part of the Project.

1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing, the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.1.6 THE SPECIFICATIONS

The Specifications are the written requirements of the Contract Documents for products, materials, workmanship, and performance of related services.

1.1.7 THE PROJECT MANUAL

The Project Manual is the volume of written Construction Documents typically containing Bidding Requirements, contract forms, Conditions of the Contract and Specifications.

1.1.8 PUNCH LIST

A punch list is a comprehensive list of incomplete, defective or incorrect Work prepared by the Contractor, Design Professional or Owner to indicate Work required to be completed. Specific punch lists required by the Contract Documents include the Substantial Completion Punch List created by the Contractor prior to application for Substantial Completion in accordance with Paragraph 9.8, and that includes the Close-Out Punch List as required by Paragraph 9.10, and any other punch list created by the Owner or Design Professional for the purposes of this Paragraph and otherwise successful completion of the Work.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

1.2.2 Reasonably Inferable, as used in this Agreement, shall mean information or knowledge that is derivable or evident by prudent and diligent examination of the Contract Documents and other information reasonably available by the Contractor or Subcontractor knowledgeable in their field, and includes items:

1. specified in the Contract Documents required to complete the Work, but not graphically indicated. Contractor shall provide the minimum product or work necessary to fulfill the specifications or otherwise the requirements of any industry standards, such as, but not limited to, final function of Work such as strength, profile, or use as indicated by the Contract Documents; and,
2. shown or graphically indicated as required to complete the Work but not specified. Contractor shall provide the minimum product or work necessary to complete the depicted Work,



such as, but not limited to, final function of Work such as strength, profile, or use as indicated by the Contract Documents.

1.2.3 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings are for convenience of reference only and shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. Such separation will not operate to make the Owner or Design Professional an arbiter of labor disputes or work agreements.

1.2.4 Words shall be first interpreted within the context they are used and by definition, if any, provided by the Contract Documents themselves. Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in accordance with such recognized meanings. If the meaning of a word is not clear from the Contract Documents or have a well-known technical or construction industry meaning, the Webster's Collegiate Dictionary, current at time of contract, meaning shall apply.

1.2.5 INCONSISTENCIES

In the event of conflicts in the Contract Documents, the most restrictive or otherwise most beneficial to the Owner shall apply to all similar conditions. Other rules for conflicts in the Contract Documents shall be that:

1. Addenda shall govern over all other Contract Documents and subsequent Addenda shall govern over prior Addenda only to the extent modified;
2. between drawings and specifications, the specifications shall govern;
3. within the drawings:
 - a) schedule, when identified as such, shall govern over notes or other directions included within the drawings.
 - b) specific note shall govern over general note.
 - c) note evidently intended to be used as a general or typical note, shall be used as such throughout.
 - d) dimensions provided shall take precedence over scaled measurements.
 - e) large scale drawings shall take precedence over smaller scale drawings; and
4. General Conditions shall govern over all sections of the Contract Documents, except as modified by Supplementary General Conditions or Addenda.
5. The Contactor shall comply with the provisions of Article 3.2 in providing notification of conflict within the Contract Documents, regardless of rules governing such conflicts and contained in this subparagraph.

1.3 CAPITALIZATION

1.3.1 Within the General Conditions, these terms are capitalized when they are used specifically in relations to the Agreement: Owner and Contractor who are parties to this Agreement, Design Professional who performs services under agreement with the Owner, Subcontractors who perform work under subcontract at any tier with the Contractor, the various Bidding and Contract Documents,



Project, Work, titles of numbered Articles and Paragraphs within the Contract Documents, and names used to identify parts of the Project. When these terms are used generically and not specifically associated with the Project, they are not capitalized.

1.4 INTERPRETATION

1.4.1 In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.5 EXECUTION OF CONTRACT DOCUMENTS

1.5.1 The Contract Documents shall be signed by the Owner and Contractor. If either the Owner or Contractor does not sign all the required documents of the Contract Documents, the Design Professional shall identify such unsigned documents.

1.5.2 Execution of the Contract by the Contractor is representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

1.6 OWNERSHIP AND USE OF DRAWINGS AND SPECIFICATIONS

1.6.1 Drawings, specifications and copies thereof shall remain the Owner's property. They are not to be used on another project. Neither the Contractor nor any Subcontractor, material supplier or equipment supplier or any person or entity shall own or claim a copyright to any Drawings, Specifications or any other documents prepared or developed for definition of the Work. The Owner will retain all common law, statutory and other reserved rights, in addition to the copyrights. The Contractor, Subcontractors, material suppliers and equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents for use in the execution of their Work under the Contract Documents. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Owner's copyrights or other reserved rights.

1.7 Risk of Cost Increase: Contractor understands and agrees that its bid took into account the possibility that prices for construction materials, labor, and other goods and services needed or used in completion of this project may increase or decrease during the course of performance of the contract. Contractor shall bear the risk of any such cost increases, and no increase or other adjustment in payment shall be made on account of such cost increases.

ARTICLE 2 OWNER

2.1 GENERAL

2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a



representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Subparagraph 4.2.1, the Design Professional does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 The Owner shall, at the written request of the Contractor, prior to commencement of the Work and thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Furnishing of such evidence shall be a condition precedent to commencement or continuation of the Work. After such evidence has been furnished, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

2.2.2 Except for permits and fees, including those required under Subparagraph 3.7.1, which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities that shall include utility expansion charges but, not tapping fees.

2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner, but shall exercise proper precautions relating to the safe performance of the Work.

2.2.4 Unless stated otherwise in the Contract Documents, the Owner shall furnish in accordance with Article 6 specific testing, adjusting and compliance monitoring and explicitly:

1. geotechnical testing and analysis including soil testing and compaction, but excluding load testing for caissons and piers; and,
2. concrete testing including slump analysis and compression testing with, at the Owner's request, the Contractor responsible for forming test cylinders or similar; and
3. testing and balancing of heating and air-conditioning systems with the Contractor responsible for timely, diligent and coordinated corrections to Work required until performance is compliant with the Contract Documents.

The Contractor shall be responsible for testing and costs as defined by Paragraph 13.5 and Subparagraph 12.2.1.1.

2.2.5 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work, under the Owner's control, shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.



2.2.6 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, five (5) copies of Drawings and Project Manuals; however, the Contractor may have more copies free of charge if they are available without additional cost to the Owner.

2.3 OWNER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven (7) day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven (7) day period, without prejudice to other remedies that the Owner may have, correct such deficiencies. In such case, an appropriate Modification in accordance with Article 7 shall be issued deducting from payments then or thereafter due the Contractor for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Design Professional's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2.4.2 If in the event that the Contractor defaults or neglects to carry out the Work to final completion in keeping with the Substantial Completion Schedule provided in accordance with Subparagraph 9.8.2 and, fails within a seven (7) day period after receipt of written notice from the Owner to correct such default with diligence and promptness, the Owner may after such seven (7) day period, without prejudice to other remedies, correct Punch List and Close-Out deficiencies to achieve project completion without further notice to the Contractor or its surety. In such case, an appropriate Modification in accordance with Article 7 shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Design Professional's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2.4.3 In carrying out the Owner's right to complete the Work in accordance with Paragraph 2.4, the Owner shall have the right to exercise the Owner's sole discretion as to the manner, methods and reasonableness of costs of completing the Work.

ARTICLE 3 CONTRACTOR

3.1 GENERAL

3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to



throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

3.1.1.1 Independent Contractor: In performing the Work, Contractor is acting and shall be deemed for all purposes to be an independent contractor. Owner and 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 Owner and Contractor. Contractor shall complete the Work according to Contractor's own means and methods of work, which shall be in the exclusive charge and control of Contractor, and which shall not be subject to the control and supervision of Owner, except as to the results of the Work. 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. Contractor, its employees, subcontractors and agents shall not hold themselves out as employees or agents of Owner. Contractor and its employees are hereby expressly precluded from and not entitled to any employee benefits from Owner.

3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Design Professional in the Design Professional's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than Contractor.

3.1.4 The Contractor shall, prior to bid, be properly licensed according to the requirements of the Construction Industries Licensing Act, Chapter 60, and Article 13 NMSA 1978 and shall ensure to the Owner that such license shall remain in effect for the duration of the Work and warranty periods.

3.1.5 Debarred or Suspended Contractors: A business (Contractor, Subcontractor, or supplier) that has either been debarred or suspended pursuant to the requirements of Sections 13-1-177 through 13-1-180, and 13-4-11 through 13-4-17, NMSA 1978, shall not be permitted to do business with the Owner and shall not be considered for award of contract during the period for which it is debarred or suspended.

3.1.6 Bribes, Gratuities and Kickbacks

3.1.6.1 It is illegal in the State of New Mexico for any public employee to solicit or accept anything of value in connection with award of contract for this Bid and for any person to offer or pay anything of value to any such public employee (30-24-1 and 30-24-2, NMSA 1978).

3.1.6.2 Pursuant to Section 13-1-191, NMSA 1978, reference is hereby made to the Criminal Laws of New Mexico (including 30-24-1, 30-24-2, and 30-41-1 through 30-41-3, NMSA 1978), which prohibit bribes, kickbacks, and gratuities, and violation of which constitutes a felony. Further, the Procurement code (13-1-28 through 13-1-199, NMSA 1978) imposes civil and criminal penalties for its violation.



3.1.7 Assignment of Antitrust Claims

3.1.7.1 The Contractor agrees that any and all claims that the Contractor may have or that may inure to the Contractor for overcharges resulting from antitrust violations as to goods, services, and materials purchased in connection with this Bid are hereby assigned to the Owner, but only to the extent that such overcharges are passed on to the Owner. The Contractor further agrees to require each of its Subcontractors and suppliers to assign any and all such claims for overcharges to the Owner by executing an assignment on the form provided by the Owner for such purpose. The executed forms (see Section 00 4000 of the Bid Documents) shall be submitted prior to the commencement of the Work or the supplying of any materials by the supplier or Subcontractor. The submission of this executed form may be waived by the Owner upon a showing of a good-faith effort by the Contractor to obtain agreement in writing from its supplier or Subcontractor. Waiver by the Owner will not unreasonably be denied.

3.1.7.2 It is agreed that the Contractor retains all rights to any such antitrust claims to the extent of any overcharges not passed on to the Owner, including the right to any treble damages attributable thereto.

3.1.8 Contracts with Nonresident Persons or Partnerships or Un-admitted Foreign Corporations; Agent for Service of Process

Contractor agrees to the requirements of Sections 13-4-21 through 13-4-24, NMSA 1978, whereby a public works contract with a nonresident person or partnership or foreign corporation not authorized to do business in the State shall contain a specific provision designating an agent resident within the State, and his address, upon whom process and writs in any action or proceeding against such business may be served in any action arising out of such contract.

3.1.9 Project Management Software: Contractor shall purchase one or more seat licenses, as needed for contractor and each participating subcontractor, of APS's project management software, as needed to manage information and communicate with the project team. APS will provide training in the use of the project management software.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 Since the Contract Documents are complementary, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Subparagraph 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating construction by the Contractor and for the purpose of discovering errors, omissions in the Contract Documents; any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly in writing to the Design Professional as a Request for Interpretation in accordance with Subparagraph 3.2.4.



3.2.1.1 Before ordering any materials or proceeding with Work, the Contractor and Subcontractors shall verify measurements at the Work site and shall be responsible for the correctness of such measurements.

3.2.2 Any design errors or omissions noted by the Contractor during this review shall be reported promptly in writing to the Owner and to the Design Professional, but it is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed Design Professional, unless otherwise specifically provided in the Contract Documents. The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations, but any suspected non conformity discovered by or made known to the Contractor shall be reported promptly in writing to the Owner and to the Design Professional. If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Design Professional and Owner, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

3.2.3 If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Design Professional in response to the Request for Interpretation pursuant to Subparagraphs 3.2.1 and 3.2.1.1, the Contractor shall make Claims as provided in Subparagraphs 4.3.6 and 4.3.7. If the Contractor fails to perform the obligations of Subparagraphs 3.2.1 and 3.2.1.1, the Contractor shall pay such costs and damages resulting from errors, inconsistencies or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents as would have been avoided if the Contractor had performed such obligations.

3.2.4 REQUEST FOR INTERPRETATION

3.2.4.1 Any question concerning a variation or deviation from the Contract Documents, including a minor change in the Work found necessary due to actual field conditions, shall be submitted to the Design Professional as a Request for Interpretation (RFI) for review and resolution before proceeding with the Work. When submitting an RFI, the Contractor must provide all information necessary for the Design Professional to promptly process, including detailed:

1. reference(s) to Specification number, Drawing page and detail, and the like;
2. description of issue;
3. drawings, photos or sketches of conditions, if necessary; and,
4. submittals or other information as necessary to facilitate resolution.

3.2.4.2 Request for Interpretation may be initiated only by the Contractor and shall be answered by Design Professional within **ten (10) days**, or other reasonable time agreed upon between the parties. All Subcontractor RFI's must be initiated through the Contractor. All answers to RFI's by the Design Professional's consultants or Owner must be initiated through the Design Professional.

3.2.4.3 If substitutions are allowed after the contract award, RFI shall not be used for any substitution request (see Subparagraph 3.4.2).



3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Design Professional and shall not proceed with that portion of the Work without further written instructions from the Design Professional with concurrence from the Owner. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any resulting loss or damage not due to negligence of the Contractor, its employees, subcontractors or their agents or employees. This paragraph shall not be deemed to create a duty on the part of the Design Professional or the Owner to the Contractor, Subcontractor or their employees to monitor for jobsite safety.

3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

3.4 LABOR AND MATERIALS

3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.4.2 The Contractor may request substitution of material only if:

1. allowed after the contract award;
2. all supporting information has been evaluated and approved by the Contractor;
3. includes a detailed itemized comparison of the proposed substitution with the specified product;
4. acceptance does not include substantial revision of Contract Documents, unless Contractor agrees to reimburse the Owner for those costs; and,
5. substitution request is submitted as a formal MCR, with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order.



3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.4.4 Drug and Alcohol Policy: During the term of the Agreement, Contractor is required to have in place and comply with a Drug and Alcohol policy that meets or exceeds the requirements and procedures contained in all applicable laws. Contractor shall provide a work environment that is free from the use, consumption, possession, sale or distribution of illegal drugs and alcohol and from the misuse of legal drugs on this project. Employees must be fit for duty and not be under the influence of illegal drugs, alcohol or controlled substances (without a valid prescription for the controlled substances) when employees are present for duty and at all times while performing the Work on this project. At a minimum, Contractor's policy shall include: reasonable testing procedures, full compliance with all Department of Transportation requirements for covered functions, including FMCSA (CDL) employees, where applicable, and compliance with all other applicable laws, regulations and decrees. Further, Contractor is responsible for testing and other related costs, and for providing all required reports to any government agency. Contractor shall require that all of its subcontractors adhere to and comply with the Drug and Alcohol Policy.

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and Design Professional that materials and equipment furnished under the Contract will be of good quality and new, unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance and improper operation, or normal wear and tear and normal usage. If required by the Design Professional, the Contractor shall furnish satisfactory evidence as to kind and quality of materials and equipment.

3.6 TAXES

3.6.1 Gross Receipts Tax (GRT)

3.6.1.1 Section 7-10-4, NMSA 1978 provides that any person (as defined in Section 7-10-3, NMSA 1978) performing services for the State, as those terms are used in the Gross Receipts Tax Registration Act (Chapter 7, Article 10, NMSA 1978), must be registered and be issued an identification number with the Taxation and Revenue Department to pay the GRT.

3.6.1.2 The identification number is needed to properly complete the approval process of the Contract; therefore, so as to cause no delay in the processing, the Contractor must register with the Department. For information:

Taxation and Revenue Department
P.O. Box 630
Santa Fe, New Mexico 87504-0630
TELEPHONE; (505) 827-0700



TRD Website: www.state.nm.us/tax/

or, TRD District Office in Albuquerque, Farmington, Las Cruces, Santa Fe or Roswell.

3.6.1.3 The Contractor shall pay New Mexico Gross Receipts and other applicable taxes specific for the Work provided by the Contractor which are legally enacted when bids are received or negotiations concluded.

3.6.1.4 If any person who performs services for the Owner is not registered to pay the gross receipt tax, the Owner shall withhold payment of the amount due until the person has presented evidence of registration with the Revenue Division to pay the GRT.

3.6.1.5 Taxes. 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 employed by Contractor for performance of the Work. Contractor shall be liable for and shall pay and shall indemnify, defend, and hold Owner harmless from all such taxes and contributions and any interest accrued and penalties imposed, and reasonable attorney fees and all taxes (including but not limited to, income, withholding, gross receipts, compensating, use and all other taxes of whatsoever kind and whatsoever nature), excises, assessments, and other charges levied by any governmental agency or authority on or because of the Work, or on any materials, equipment, services, or supplies furnished in the performance of the Work. On all invoices or progress payment invoices, Contractor shall separately show all New Mexico gross receipts, compensating, sales, and other similar taxes charged to Owner, provided that in no event shall interest or penalties on such taxes be reimbursable by Owner. 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.

3.6.2 Nonresident Contractor's Requirements for Gross Receipts Tax Surety Bond

3.6.2.1 Section 7-1-55A, NMSA 1978 provides that any person (as defined in Section 7-1-3, NMSA 1978) engaged in the construction business who does not have his principal place of business in New Mexico and enters into a prime construction contract to be performed in this State shall, at the time such contract is entered into, furnish the Taxation and Revenue Department with a surety bond or other acceptable security in a sum equivalent to the GRT to be paid under the contract multiplied by the applicable rate of the GRT imposed by Section 7-9-4, NMSA 1978 to secure payment of the tax imposed on the gross receipts from the Contract. He shall obtain a certificate from the Taxation and Revenue Department that the requirements of this paragraph have been met.

3.6.2.2 If the total sum to be paid under the Contract is changed by ten percent (10%) or more after the date the surety bond or other acceptable security is furnished to the Director or his delegate, such person shall increase or decrease, as the case may be, the amount of the bond or security within **fourteen (14) days** after the change (7-1-55B, NMSA 1978).



3.6.2.3 In addition to the above requirements, the Contractor will be subject to all the requirements of Section 7-1-55, NMSA 1978.

3.7 PERMITS, FEES AND NOTICES

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the Building Permit, Building Permit Planchecking Fees, Fugitive Dust Control Construction Permit, Storm Water Pollution Prevention Plan, and other permits and governmental fees, licenses and inspections and Certificate of Occupancy necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when bids are received, negotiations concluded, and facilities occupied. Changes or modifications to the work shall include all requirements of this paragraph.

3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work. Certificates of Inspection, use and occupancy will be delivered to the Owner upon completion of the Work in sufficient time for occupation of the facility in accordance with the approved schedule for the Work. Contractor shall deliver a photocopy of the Building Permit to the Design Professional and Owner as soon as it is obtained.

3.8 ALLOWANCES

3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Document. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

3.8.2 Unless otherwise provided in the Contract Documents:

1. allowances shall cover the cost of the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts.
2. Contractor's costs for unloading and handling at the site, labor, installation costs, overhead profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances;
3. whenever costs are more than or less than allowances, the contract Sum shall be adjusted accordingly by appropriate modification in accordance with Article 7. The amount of the Change Order shall reflect:
 - a) the difference between actual costs and the allowances under Clause 3.8.2.1);
 - and,
 - b) changes in Contractor's under Clause 3.8.2.2.

3.8.3 Materials and equipment under an allowance shall be selected by the Owner in sufficient time to avoid delay in Work.

3.9 SUPERINTENDENT

3.9.1 The Contractor shall employ a competent Superintendent, who is acceptable to the Owner, and



necessary assistants who shall be in attendance at the Project site during performance of the Work. The Superintendent shall represent the Contractor, and communication given to the Superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

3.9.2 Within **ten (10) days after Notice of Award** and commencement of the Work, the Contractor shall submit to the Design Professional, for the Owner's consideration for approval, a resume and Statement of Qualification of proposed Superintendent(s) and assistants. During construction, the Contractor shall replace individuals who are no longer acceptable to the Owner and shall submit a resume and Statement of Qualification for proposed replacements.

3.10 CONTRACTOR'S SCHEDULES, LOGS, MEETINGS AND REPORTS

3.10.1 The Contractor, promptly after being awarded the Contract and before the first payment application, shall prepare and submit for the Owner's and Design Professional's information a Critical Path Construction Schedule for the Work that indicates the intended start and completion of the various construction activities, which shall be implemented and adhered to by the Contractor, Subcontractors, material suppliers and equipment suppliers. At a minimum, the schedule shall be a GANTT type schedule and shall not exceed time limits allowed by the Contract Documents with no fewer work breakdown events than line items of the Schedule of Values. The Schedule will incorporate and make provisions for significant known Owner activities, holidays and other special occasions. The Contractor will acknowledge that a reduction in activity may be necessary during the time prior to and during periods of special Owner events or occasions. The schedule shall be revised to indicate Work complete before each payment application and at appropriate intervals as required by the conditions of the Work and progress of the Work. The revised schedule shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work including, but not limited to time recovery strategies and Recovery Plan, if progress of the Work is behind schedule.

3.10.1.1 The Contractor shall perform the Work in general accordance with the most recent schedule submitted to the Owner and Design Professional.

3.10.2 The Contractor shall prepare before the second payment application and keep current, for the Design Professional's approval, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Design Professional **fourteen (14) days**, or as otherwise agreed between the parties, to review submittals. A Submittal Log shall be maintained by the Contractor indicating for each scheduled submittal, the appropriate specification number, the date of submission, the date of approval and any re-submittals.

3.10.3 Bi-Weekly Meeting: Prior to the start of Work on the site and in no event later than the first payment application, the Contractor shall establish a bi-weekly meeting time with the Owner and Design Professional and shall establish an agenda for the meeting. Contractor shall host the weekly job site meeting and shall maintain meeting minutes and distribute such notes to all parties in attendance and to those requested at the next meeting within **three (3) days** of the meeting. The meetings shall include but not be limited to:



1. adoption of previous meeting's meeting notes that include list of attendees;
2. new business;
3. old business;
4. items requiring action with those assigned to action and expected action date;
5. outstanding RFI's;
6. outstanding submittals; and,
7. other business including review of Progress Report or Payment Application if appropriate.

Meetings shall be open forum, chaired by the Contractor and shall include any Subcontractors doing work or anticipating work in the near future or for any other reason, Owner, any entities that the Owner would like to attend, including User Representative or users of completed project, Design Professional, any consultant(s) to the Design Professional who have or will have any work under way associated with the consultant's specialty. The Contractor shall alert the Owner and Design Professional as to which consultants are requested to attend the next meeting and include request in the meeting minutes. Phone or web conferencing may be used if effective in the opinion of the Owner.

3.10.3.1 Progress Report: Each month, at the regularly scheduled weekly meeting that is just prior to the Contractor submitting the Payment Application for that month; the Contractor shall present a Progress Report. The Contractor prepared Progress Report shall review the Project Schedule, review the Schedule Recovery Plan if necessary, and review the Three-Week-Look-Ahead Schedule.

3.10.3.2 The Contractor prepared Three-Week-Look-Ahead Schedule shall include specific details of Work expected to be accomplished three weeks into the future, identify critical path Work to be completed, and identify potential obstacles including RFIs, submittals, material deliveries, utility hook-ups or any other event or task that might hinder the progress of the Work.

3.10.4 Emergency Contact List: The Contractor shall at the first weekly meeting, deliver to the Owner and the Design Professional an Emergency Contact List that will include emergency contacts for every company that has worked or will do work on the Project. List shall include company, main office number, after hours office number(s); and, both a primary and secondary contact name, cell number and home number. The Contractor shall keep the Emergency Contact List current and distribute the most current version to Owner and Design Professional.

3.10.5 Daily Report: The Contractor shall prepare a Daily Report each day that Contractor, Subcontractors or any other entity are on the Project. The Daily Reports shall be maintained at the site, be well organized and include:

1. report date and who prepared the report;
2. weather conditions - low temp, high temp, visibility, humidity, wind, wind direction, cloud conditions, precipitation amount, other notes;
3. companies present by name and their - number of workers, work location, total man hours that day for each company;
4. equipment - type, source, units of work done, location of work, hour meter reading;
5. material brought to site - description, units, quantity, quality, location, time;
6. visitors to site - name, company, time;



7. safety concerns - company, contact, noticed by, work activity, safety issue, requirement, outcome; and,
8. quality assurance and control - company, description of issue, specification section, issued by.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 The Contractor shall maintain at the site for the Owner, one record copy of the As-built Drawings, Specifications, Addenda, Modification / Change Requests, and other Modifications, in good order and marked currently to record field changes and selections made during construction, as well as, one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals, and Meeting Notes and Daily Job Reports. These shall be available to the Design Professional and the Owner and shall be delivered to the Design Professional for submittal to the Owner upon completion of the Work. Information maintained in PSFA-CIMS in accordance with Subparagraph 4.2.4.1 with web access at the site shall be considered "at the site".

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor for a Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

3.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Design Professional is subject to the limitations of Subparagraph 4.2.7. Informational submittals upon which the Design Professional is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned without action.

3.12.4.1 Shop Drawings, Product Data, Samples and similar shall not be submitted on a "piece meal" basis and shall be submitted in packages, in accordance with the Construction Documents, so that like or interrelated submittals, that must be compared or correlated one to another, are submitted together. Submittals not submitted as a package so that they may be compared one to another for approval or other action shall be returned to the Contractor without review but, with explanation by the Design Professional as why and what is required when re-submitted. For example, finish materials such as tile, carpet, wall covering and paint shall be submitted as a package.



3.12.4.2 If substitutions are allowed after the contract award, a submittal shall not be used for any substitution request (see Subparagraph 3.4.2).

3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Design Professional Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Design Professional without action.

3.12.6 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Design Professional and, if required, by the Jurisdiction Having Authority.

3.12.8 The Work shall be in accordance with approved submittals, except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Design Professional's approval of Shop Drawings, Product Data, Samples or similar submittals, unless the Contractor has substitution approved in accordance with Subparagraph 3.4.2, or unless the Contractor informed the Design Professional in writing of such deviation at the time of submittal and the Design Professional has given written approval to the specific deviation as a minor change as a Supplemental Instruction. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Design Professional's approval thereof.

3.12.9 The Contractor shall direct specific attention, in writing on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Design Professional on previous submittals. In the absence of such written notice the Design Professional's approval of a resubmission shall not apply to such revisions.

3.12.10 The Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a Design Professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Design Professional will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be



provided by a properly licensed Design Professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. The Owner and the Design Professional shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such Design Professionals, provided the Owner and Design Professional have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Subparagraph 3.12.10, the Design Professional will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

3.12.11 The Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

3.13 USE OF SITE

3.13.1 The Owner assumes no responsibility or liability for the physical conditions or safety of the Work site or for any improvements located on the Work site. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment to either the Contract Sum or Contract Time concerning any failure by the Contractor or Subcontractor to comply with the requirements of this Paragraph 3.13.

3.13.2 The Contractor will bear the cost and make the necessary arrangements and provisions for all construction water required during the entire construction period through the Owner or otherwise.

3.13.3 The Contractor will bear the cost and make the necessary arrangements and provisions for all construction electricity including distribution required during the entire construction period through the Owner or otherwise.

3.13.4 The Contractor will bear the cost and be responsible for temporary lighting, heating and cooling for the entire project.

Exception: If available and at no premium cost to the Owner, the Owner will at no cost to the Contractor, allow the Contractor to utilize the Owner's existing lighting, heating and cooling providing Contractor will return systems to like or better condition that shall include, but not be limited to, new lamping, new filters, and the like.

3.13.5 Any temporary utility or other work done by the Contractor to accommodate Work requirements shall be removed at the conclusion of the Work and all finishes shall be repaired to match the existing, or in the areas of new construction, equal to or exceeding the requirements of the Contract Documents.

3.13.6 The Contractor shall request in writing any utility shut downs well in advance of necessity of any shut down and shall not proceed with any shut down without prior Owner approval. The Owner shall not be required to make any adjustment to either the Contract Sum or Contract Time concerning any failure by the Contractor or Subcontractor to comply with the requirements of this Subparagraph 3.13.6.



3.13.7 The Contractor shall provide and maintain a suitable temporary main field office at the Project site. The Office may be in, or a part of, the existing facility, provided that prior approval is obtained from the Owner. The Contractor will move or remove their office from the existing facility at the request of the Owner.

3.13.8 The Contractor may, if space is available, allow Subcontractors, material suppliers and equipment suppliers to provide and maintain field offices or storage trailers on the Project site for their own use. Locations and size of any office or storage trailers shall be as approved by the Contractor and Owner prior to their placement on site. The Owner or Contractor may at any time require any temporary building or trailer to be moved or removed

3.13.9 The Contractor shall conduct and confine operations at the site to areas as permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.13.10 All project related vehicles either company or personal vehicles may park on-site only in areas designated by the Owner and Design Professional. Parking will only be provided to the extent space on site will allow. All Contractors' parking must be well removed from normal facility traffic, and especially away from any pedestrian crossings, walkways, or drop off or loading areas.

3.13.11 All Contractor access to the Project site shall be by a designated construction entrance as directed by the contract documents, the Design Professional and the Owner, and shall be enforced by the Contractor.

3.13.12 Access to existing facility work areas, either occupied or not occupied, shall be controlled by the Owner. Every effort will be made by the Contractor to cooperate with the Owner's security requirements and policies. Access to a work area must be in accordance with the times and conditions scheduled and agreed to by all parties. Any access, other than at normally scheduled work times, must be coordinated with the Owner or Owner's appointee at least 48 hours in advance. The Owner has the right to restrict or limit access as necessary to meet their needs, especially in regard to security and safety. Each Contractor, Subcontractor, or supplier's full cooperation is required.

3.13.13 The Project working hours shall be those established by the Contract Documents and as agreed by the Owner. Any changes in project working hours such as adding shift work, extending work day hours or other similar changes must be submitted least forty-eight (48) hours in advance to the Owner for consideration.

3.13.14 Contractor shall make every effort to minimize disruptions such as noise or dust and shall provide safe access and egress to the Owner's operations, facility, portion of facility, or surrounding areas, including, but not limited to neighborhood or community, and shall, to inform and gain approval from the Owner of planned work, prepare and present to the Owner and Design Professional for Owner approval prior to beginning construction or using the site a:

1. schedule for the work, to include Phasing Plans, proposed hours of operations, and activities to take place on weekends, school holidays and/or other special access requirements;
2. site logistics plan, showing proposed secure and fenced areas, locations and types of temporary barricades, material storage and staging areas, school property entrances used for



material deliveries, and special material or equipment storage requirements. This plan will include a description and proposed location for the Contractor's temporary office, storage trailers, Subcontractor's trailers, sanitary facilities, employee parking areas, etc.;

3. detailed construction and phasing plan, to include locations of proposed temporary dust or noise partitions, alternate emergency egress routes, temporary facilities, means and path of moving materials and equipment into the facility, and provisions for maintaining and supplying required utility services; and,

4. routing plan to maintain safe ingress and egress to all areas at all times for students, staff and public either nearby or within the Project site that shall include re-routing pedestrian ways, re-routing traffic, erect routing signs, building of bridges, barricades, pedestrian tunnels, or whatever effort that will best accommodate Owner operations and provide required protection while work is in progress ensuring that no entrances or exits are blocked, closed off, or restricted in any way unless prior approval is granted by the Owner and the Fire Marshall or other jurisdiction having authority.

3.13.15 Contractor shall ensure that any and all of the Contractor's flammable liquids are stored outside of the building, and transported in approved containers. Paint, paint thinners, gasoline, oil, roofing materials or other flammable materials shall be stored fifty (50) feet, or more, outside of all buildings, marked as to contents and properly protected. The Contractor shall not pour flammable or toxic solvents, thinners, etc., into drains and sewers.

3.13.16 Whenever electric light for illumination purposes is found necessary for the safe progress of the work, the Contractor shall provide such lights as may be required to properly execute the work. This temporary lighting shall be constructed and arranged as not to interfere with the progress of other trades or Contractors working in the facility. This system of temporary lighting shall be erected and maintained strictly in accordance with the controlling codes and OSHA standards. The Contractor shall furnish all bulbs and temporary lighting devices required to carry on the work for all Trades under their Contract.

3.13.17 In accordance with Paragraphs 3.15, 6.3, 10.2 and others of the General Conditions, the Contractor shall be responsible for the daily removal and disposal of all rubbish, debris and trash from the site and building which results from Work. The Contractor shall provide a dumpster, or other trash removal facility, for use by their Subcontractors and all rubbish, debris and trash shall be deposited in Contractor provided containers located at an approved location on the site. There shall be no burning of trash or other open fires on the site. If in the opinion of the Owner neatness is not maintained, the Owner may following appropriate notice to the Contractor, have the area cleaned and withhold cost from any amounts owing to Contractor.

3.13.18 The Contractor shall, at the completion of Work in a given area, expeditiously remove all surplus material, equipment, and debris of every nature resulting from their operations, and put the areas in a neat, clean, and orderly condition. At Final Completion of the Project or an area of the Project, the Contractor shall final clean from top to bottom inside and out everything to the Owner's satisfaction that including plumbing fixtures, equipment, windows, floors, walls, light fixtures and the like in accordance with Paragraph 3.15 of the General Conditions.

3.13.19 The Contractor shall in accordance with Article 10, afford protection to all adjacent areas, buildings, roads, walks, and all other property adjacent to their work. Any portion of a building or



other property damaged during construction operations shall be promptly, properly and thoroughly repaired and replaced without cost to the Owner.

3.13.20 Contractor shall maintain a safety plan that includes how the Contractor proposes to meet all OSHA and related requirements, details on safety equipment to be utilized, how the potential for fire and other potential hazards will be addressed, welding and cutting procedures and, how the Contractor will maintain safety related systems such as fire alarms, intercoms, and sprinklers while the Work is proceeding in accordance with Paragraph 3.3 and other parts of the General Conditions.

3.13.21 Jobsite Requirements Pertaining to Personnel:

1. All personnel on site, directly or indirectly in the employ of Contractor, are restricted from any interaction with any Owner Staff, Students, or other members of the public while on, or adjacent to Owner property except through jobsite meetings in accordance with Subparagraph 3.10.3 or as otherwise determined by the Owner;
2. shall remain in their designated work areas. Communications with any non-project related persons on or near the site shall be through project Superintendent;
3. no firearms or any other types of weapons, of any sort will be allowed on site. If any person is found to be in possession of any Firearm, of any kind, they will be directed to leave immediately and will not be allowed to return. This includes any firearms found in Company or Private vehicles, tool boxes or brought on site in any other manner;
4. it is the policy of the Owner to prohibit smoking on any occupied school campus and on a new, un-occupied, site to limit smoking to designated areas;
5. it is the policy of the Owner to prohibit use, possession, sale, and distribution of alcohol, drugs, or other controlled substances on its premises and to prohibit the presence of an individual with such substances in their body from the workplace, the Contractor shall enforce this policy; and,
6. Contractor agrees that any employee who is found in violation of requirements of this Paragraph, or of the Contract Documents, or who refuses to permit inspection shall be barred from the Project site at the discretion of the Owner in accordance with Subparagraph 13.8.4.1.

3.14 CUTTING AND PATCHING

3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.14.1.1 Cutting and patching shall be done by individuals skilled in working the materials involved so to prevent a reduction of visual qualities or resulting in substantial evidence of the cut-and-patch work.

3.14.2 The Contractor shall not damage or endanger a portion of the Work, fully or partially completed, or existing construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor will not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.



3.15 CLEANING UP

3.15.1 The Contractor on a daily basis shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials and shall then thoroughly clean the premises and the site to the Owner's satisfaction.

3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor in accordance with Paragraph 6.3.

3.16 ACCESS TO WORK

3.16.1 The Contractor shall provide the Owner and Design Professional access to the Work in preparation and progress wherever located.

3.17 ROYALTIES, PATENTS AND COPYRIGHTS

3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Design Professional harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Design Professional. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished in writing to the Design Professional.

3.18 INDEMNIFICATION

3.18.1 To the fullest extent permitted by law and to the extent claims, damages, losses or expenses are not covered by Project Management Protective Liability insurance purchased by the Contractor in accordance with Paragraph 11.3, the Contractor shall indemnify and hold harmless the Owner, Design Professional, Design Professional's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

This Agreement to indemnify shall not extend to liability, claims, damages, losses or expenses, including attorney fees, arising out of the:

1. preparation or approval of maps drawings, opinions, reports, surveys, change orders, designs, or specifications by the parties indemnified hereunder, or the agents or employees of the parties indemnified hereunder; or,



2. giving or failure to give directions or instructions by the parties indemnified or their agents or employees, where such giving or failure to give directions or instructions is the primary cause of bodily injury to persons or damage to property.

3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a Subcontractor, or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Subparagraph 3.18.1 shall not be limited by a limitation on amount or type of damages compensation or benefits payable by or for the Contractor, Subcontractor under any Liability Insurance, Workers' Compensation Acts, Disability Benefit Acts or other employee benefit acts.

3.19 REPRESENTATIONS AND ASSURANCES

3.19.1 The Contractor, in addition to the requirements of the Contract Documents, represents to the Owner, as an inducement to the Owner to execute the Owner-Contractor Agreement, which representations will survive the execution and delivery of the Agreement and the completion of the Work that Contractor:

1. is financially solvent, able to pay debts, and has sufficient working capital to complete the Work;
2. is able to furnish the plant, tools, materials, supplies, equipment, skilled labor and sufficient experience and competence required to complete the Work equal to or exceeding industry standards;
3. in accordance with Subparagraph 3.1.4, is authorized and properly licensed to do business in the State of New Mexico and in the locale where the Work is located;
4. in execution of the Agreement and performance thereof is within the Contractor's duly authorized powers; and
5. Subcontractors, material suppliers and equipment suppliers have visited the site of Work and have become familiar with the conditions under which the Work is to be performed, obtained all available information and have correlated observations and acquired information with the requirements of the Contract Documents including conditions:
 - a) bearing upon access to the site, accommodations required, transportation, disposal, handling and storage;
 - b) affecting availability of labor, materials, equipment, water, electricity, utilities and roads;
 - c) such as weather, river stages, flooding;
 - d) related to the apparent form and nature of the Work site, including the surface and sub-surface conditions; and,
 - e) that in general would be deemed by a prudent contractor to be material to the Work as to assess risk, contingencies and other circumstances.

ARTICLE 4 ADMINISTRATION OF THE CONTRACT



4.1 DESIGN PROFESSIONAL

4.1.1 The term "Design Professional" means the Architect, Engineer or other professional person lawfully licensed to practice the profession within the State of New Mexico and can fulfill the requirements of the Contract Documents within that person's licensed authority. If lawfully allowed, the Design Professional shall also mean the Design Professional's authorized representative unless the Owner has a reasonable objection.

4.1.2 Duties, responsibilities and limitations of authority of the Design Professional as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Design Professional. Consent shall not be unreasonably withheld.

4.1.3 If the employment of the Design Professional is terminated, the Owner shall employ a new Design Professional against whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the former Design Professional.

4.1.4 If there is no Design Professional, the Owner shall assume the responsibilities for Administration of the Contract Documents.

4.2 DESIGN PROFESSIONAL'S ADMINISTRATION OF THE CONTRACT

4.2.1 The Design Professional will provide administration of the Contract as described in the Contract Documents, and will be an Owner's representative (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the one-year period for correction of Work described in Paragraph 12.2. The Design Professional will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

4.2.2 The Design Professional, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations (1) to become familiar with and to keep the Owner informed about the progress and quality of the Work completed, (2) to use all reasonable efforts to guard the Owner against defects and deficiencies in the Work, and (3) to determine in general if the Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. The Design Professional will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work that is the responsibility of the Contractor to provide. The Design Professional will neither have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Subparagraph 3.3.1. However, if the Design Professional becomes aware of the failure of the Contractor, Subcontractors or any other person or entity performing any of the Work to use proper construction means, methods, techniques, sequences, procedures, safety precautions and programs or failure of any of the foregoing parties to carry out the Work in accordance with the Contract Document, the Design Professional shall promptly notify the Contractor and the Owner of the deficiency.



4.2.3. The Design Professional will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Design Professional will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

4.2.4.1 Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized or requested by the Owner, the Owner and Contractor shall endeavor to communicate with each other through the Design Professional about matters arising out of or relating to the Contract. Communications by and with the Design Professional's consultants shall be through the Design Professional. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

4.2.4.2 English is the language that will be used on site to issue all directions, used in all project related meetings, and used in all project related correspondence. Contractor, Subcontractors, material suppliers and equipment suppliers' foremen and supervisory staff, must be able to read and converse in English, and be able to receive and understand all directions issued by the Owner and Design Professional.

4.2.4.3 Except as otherwise provided in the contract document, project team information and communications shall be conducted electronically using the APS project management software. See also 3.1.9.

4.2.5 Based on the Design Professional's evaluations of the progress and quality of the Work, Contractor's Application for Payment and all other information available to the Design Professional, the Design Professional shall within **five (5) days** of receipt of a properly completed Application for Payment certify to the Owner the undisputed amount recommended for payment to the Contractor and shall provide specific reasoning for denial of disputed amounts.

4.2.6 The Design Professional will have authority to reject Work that does not conform to the Contract Documents, and shall do so unless, after consultation with the Owner, Owner instructs otherwise. Whenever the Design Professional considers it necessary or advisable, the Design Professional will have authority, subject to the Owner's approval, to require inspection or testing of the Work in accordance with Subparagraphs 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Design Professional nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Design Professional to the Contractor, Subcontractors, material and equipment suppliers, their agents or employee, or other persons or entities performing portions of the Work.

4.2.7 Unless rejected in accordance with Subparagraph 3.12.4.1 or is otherwise not in compliance with Section 3 of this Agreement, the Design Professional, shall within a reasonable time not to



exceed **fourteen (14) days**, or other reasonable time agreed upon by the parties, review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, for the purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review of such submittals is conducted solely in the interest of the Owner, and shall not relieve the Contractor of responsibility for determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating

instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Design Professional's review of the Contractor's submittals shall not relieve the Contractor of any obligations of these General Conditions. The Design Professional's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Design Professional, of any construction means, methods, techniques, sequences or procedures. The Design Professional's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.7.1 The Contractor shall be responsible for cost of inordinate re-reviews, exceeding two, by Design Professional due to non-compliance with Subparagraph 3.12.6.

4.2.7.2 Rejection of any submittal due to non-compliance with Subparagraph 3.12.6 shall not be the basis for claim for a project delay..

4.2.8 The Design Professional may prepare for Owner consideration, Modification / Change Requests and Change Orders. The Design Professional shall review Contractor proposals for adjustment to the Contract Sum or Contract Time relative to a Modification / Change Request and shall either approve, reject or suggest compromise to such proposals.

4.2.8.1 The Design Professional may authorize Supplemental Instructions for minor changes in the Work as provided in Paragraph 7.4, provided there is no material change to the time, cost, specification or scope of the Work.

4.2.9 The Design Professional will conduct inspections to make recommendations to the Owner of the date or dates of Substantial Completion and the date of Final Completion, will receive, approve and forward to the Owner, for the Owner's records, written warranties, Certificates of Insurance and related documents required by the Contract and assembled by the Contractor and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.2.10 If the Owner and Design Professional agree, the Design Professional will provide one or more project representatives to assist in carrying out the Design Professional's responsibilities at the site.

4.2.11 Subject to the claims procedures set forth in Paragraph 4.3, the Design Professional will, in the first instance, interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Design Professional's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no agreement is made concerning the time within which



interpretations required of the Design Professional shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Design Professional to furnish such interpretations until **ten (10) days** after written request is made for them.

4.2.12 Interpretations and decisions of the Design Professional will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of

drawings. When making such interpretations and initial decisions, the Design Professional will make all reasonable efforts to secure faithful performance by both the Owner and the Contractor and will not show partiality to either, and will not be liable for results or interpretations or decisions so rendered in good faith.

4.2.13 The Design Professional's decisions on matters relating to aesthetic effect will, with the Owner's consent, be final if consistent with the intent expressed in the Contract Documents.

4.3 CLAIMS AND DISPUTES

4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 Time Limits on Claims. Claims by either party must be initiated within **twenty-one (21) days** after occurrence of the event giving rise to such Claim or within **five (5) days** after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be initiated by written notice to the Design Professional and the other party.

4.3.3 Continuing Contract Performance. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Subparagraph 9.7.1 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

4.3.4 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than **twenty-one (21) days** after first observance of the conditions. The Design Professional will promptly investigate such conditions and if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Design Professional determines that the conditions at the site are not materially different from those indicated in the Contract



Documents and that no change in the terms of the Contract is justified, the Design Professional shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within **twenty-one (21) days** after the Design Professional has given notice of the decision. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Design Professional for initial determination, subject to further proceedings pursuant to Paragraph 4.4.

4.3.5 Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.6.

4.3.6 If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Design Professional, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Design Professional, (4) unjustified failure of payment by the Owner, (5) termination of the Contract by the Owner, or (6) Owner's suspension, Claim shall be filed in accordance with this Paragraph 4.3.

4.3.7 CLAIMS FOR ADDITIONAL TIME

4.3.7.1 If the Contractor wishes to make Claim for an increase in the Contract Time, it shall be submitted as a Modification / Change Request in accordance with Article 7. In the case of a continuing delay only one Claim is necessary.

4.3.7.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction. Substantiation must include supporting evidence from the U.S. Weather Bureau or similar for the previous ten (10) year averages for the locale of the Project, as well as, evidence supported by original project schedule and daily job logs that specific Work events falling on the critical path were delayed.

4.3.8 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding **five (5) days** after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

4.3.8.1 The Contractor shall promptly notify the Owner and Design Professional in writing of any claims received by the Contractor for personal injury or property damage related to the Work.

4.3.9 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if



quantities originally contemplated are changed in a proposed Modification / Change Request by more than fifteen percent (15%), the applicable unit prices shall be equitably adjusted in accordance with Article 7.

4.3.10 Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes damages incurred by the:

1. Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
2. Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, loss of profit except anticipated profit arising directly from the Work performed.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Subparagraph 4.3.10 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

4.4 RESOLUTION OF CLAIMS AND DISPUTES

4.4.1 Decision of Design Professional. Claims, including those alleging an error or omission by the Design Professional, but excluding those arising under Paragraphs 10.3 through 10.5, shall be referred initially to the Design Professional for decision. An initial decision by the Design Professional shall be required as a condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date final payment is due, unless **thirty (30) days** have passed after the Claim has been referred to the Design Professional with no decision having been rendered by the Design Professional. The Design Professional will not decide disputes between the Contractor and persons or entities other than the Owner.

4.4.2 The Design Professional will review Claims and within **ten (10) days** of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) recommend approval of the Claim, (4) suggest a compromise, or (5) advise the parties that the Design Professional is unable to resolve the Claim if the Design Professional concludes that, in the Design Professional's sole discretion, it would be inappropriate for the Design Professional to resolve the Claim.

4.4.3 In evaluating Claims, the Design Professional may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Design Professional in rendering a decision. The Design Professional may request the Owner to authorize retention of such persons at the Owner's expense.

4.4.4 If the Design Professional requests a third party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within **ten (10) days** after receipt of such



request, and shall either provide a response on the requested supporting data, advise the Design Professional when the response or supporting data will be furnished or advise the Design Professional that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Design Professional will either reject or approve the Claim in whole or in part.

4.4.5 The Design Professional will approve or reject Claims by written decision, which shall state the reasons therefore and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Design Professional shall be final and binding on the parties but subject to arbitration.

4.4.6 A written decision of the Design Professional shall state that (1) the decision is final, but subject to arbitration and (2) a demand for arbitration of a Claim covered by such decision must be made within **thirty (30) days** after the date on which the party making the demand receives the final written decision, then failure to demand arbitration within said **thirty (30) days** period shall result in the Design Professional's decision becoming final and binding upon the Owner and Contractor. If the Design Professional renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence, but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

4.4.7 Upon receipt of a Claim against the Contractor or at any time thereafter, the Design Professional or the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Design Professional or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.5 (NOT USED)

4.6 ARBITRATION

4.6.1 Any Claim arising out of or related to the Contract, except those waived as provided for in Subparagraphs 4.3.10, 6.2.3, 9.11.4 and 9.11.5, shall after decision by the Design Professional or **thirty (30) days** after submission of the Claim to the Design Professional, be subject to arbitration. Prior to arbitration, the parties shall endeavor to resolve disputes informally.

4.6.2 Claims not resolved by other means shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect. The Demand for Arbitration shall be filed in writing with the other party to the Contract and with the American Arbitration Association, and a copy shall be filed with the Design Professional.

4.6.3 A Demand for Arbitration shall be made within the time limits specified in Subparagraphs 4.4.6 and 4.6.1 as applicable, and in other cases within a reasonable time after the Claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.



4.6.4 Claims and Timely Assertion of Claims. The party filing a Notice of Demand for Arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

4.6.5 Arbitration proceedings under this Agreement may be consolidated or joined with arbitration proceedings pending between other parties if the arbitration proceedings arise out of the same transaction or relate to the same subject matter. Consolidation will be by order of the arbitrator, in any of the pending cases, or if the arbitrator fails to make such an order, the parties may apply to any court of competent jurisdiction within Bernalillo County, New Mexico, for such an order. Inclusive to this Subparagraph are the Owner, the Design Professional, the Contractor, all subcontractors, material suppliers, equipment suppliers, engineers, designers, lenders, sureties, and all other parties concerned with the construction of the Project are bound, each to each other, by this Subparagraph, provided such party has signed this Agreement or has signed an agreement which incorporates this Agreement by reference or signs any other agreement to be bound by this arbitration clause.

4.6.6 Judgment on Final Award. The award rendered by the arbitrator or arbitrators shall be final and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

ARTICLE 5 SUBCONTRACTS

5.1 DEFINITIONS

5.1.1 A Subcontractor is a person or entity who has a direct or indirect contract with the Contractor to perform a portion of the Work regardless of contractual tiers below the prime contract between the Owner and Contractor. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after Notice of Intent to Award, shall furnish in writing to the Owner through the Design Professional the names of entities and key personnel (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Design Professional will promptly reply to the Contractor in writing stating whether or not the Owner or the Design Professional, after due investigation, has reasonable objection to any such proposed entity or person. Failure of the Owner or Design Professional to reply promptly shall constitute notice of no reasonable objection. The requirements of this Subparagraph 5.2.1 shall supplement Subcontractor listing at bid as required by §13-4-34 NMSA 1978.

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or



Design Professional has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

5.2.3 If the Owner or Design Professional has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Design Professional has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by the change, and an appropriate Modification in accordance with Article 7 shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

5.2.4 The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Design Professional makes reasonable objection to such substitute. Any substitutions of a Subcontractor will comply with the New Mexico Subcontractor Fair Practices Act to the extent that the Subcontractors Fair Practices Act is applicable.

5.3 SUBCONTRACTUAL AND SUPPLIER RELATIONS

5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including performance of Work, responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Design Professional. Each subcontract and supplier agreement shall preserve and protect the rights of the Owner and Design Professional under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with suppliers. The Contractor shall make available to each proposed Subcontractor and supplier, prior to execution of the Agreement, copies of the Contract Documents to which the Subcontractor and suppliers where appropriate will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents.

5.3.2 Nothing contained in Subparagraph 5.3.1 or elsewhere in the Contract Documents shall create any contractual relationship with or cause of action in favor of a third party against the Owner.

5.3.3 Each entity intending to do work on the Project shall, prior to bid, be properly licensed according to the requirements of the Construction Industries Licensing Act, Chapter 60, Article 13 NMSA 1978 and shall ensure to the Contractor and to the Owner that such license shall remain in effect for the duration of the Work and warranty periods.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS AND SUPPLIER AGREEMENTS



5.4.1 Each subcontract or supplier agreement for a portion of the Work may be assigned by the Contractor to the Owner provided that assignment is:

1. effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract or supplier agreements which the Owner accepts by notifying the Subcontractor, supplier and the Contractor in writing; and
2. subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

5.4.2 Upon such assignment, if the Work has been suspended for more than **thirty (30) days**, the Subcontractor's or supplier's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these, including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Paragraph 4.3.

6.1.2 When separate contracts are awarded for different portions of the Project or other Construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor and Subcontractors shall participate with other separate contractors, the Owner's own forces and the Owner in reviewing and coordinating their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised. The Contractor and Subcontractors shall not delay or cause additional expense to another contractor by neglecting to perform correctly or to an agreed schedule. In the absence of a schedule mutually agreed upon by all parties, the Owner may create a binding schedule for all parties or take other appropriate action to avoid unnecessary delay and damages.

6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the



Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11, and 12.

6.1.5 Unless otherwise provided in the Contract Documents, the Owner's separate contractor shall test, adjust and balance (TAB) the HVAC system to design requirements in coordination with the Contractor's or Subcontractors own forces. The TAB work shall integrate with the Contractor's or Subcontractor's installation of the Work, equipment start-up and operational testing as required by the Contract Documents. Coordination and cooperation for this work and other similar Owner contractor work shall be in accordance with Paragraph 6.2.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the Owner and separate contractors' reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

6.2.2 If part of the Contractor's Work depends on proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Design Professional and Owner apparent discrepancies or defects in such other construction that would render it unsuitable for proper execution and results. Failure of the Contractor to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

6.2.3 The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities and damage to the Work or defective construction of the Owner or a separate Owner contractor. Should the Contractor sustain any personal injury or damage to property through any act or omission of any other Contractor having a contract with the Owner, the Contractor sustaining damage will have no claim or cause of action against the Owner for such damage and hereby waives any such claim.

6.2.4 The Contractor shall promptly remedy damage caused by the Contractor to completed or partially completed or existing construction or to property of the Owner or separate contractors as provided in Subparagraph 10.2.5.

6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Subparagraph 3.14.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Design Professional will allocate



the cost among those responsible.

- .1 Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by Owner's employees.

ARTICLE 7 CHANGES IN THE WORK

7.1 GENERAL

7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Modification / Change Request, or by Supplemental Instruction for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

7.1.2 Any material change in the Work require a Modification / Change Request (MCR) that has been finalized by agreement by the Owner and based on proposal from the Contractor and recommendation of the Design Professional. A Change Order, required to modify the Purchase Order, shall accumulate approved MCRs, and must be approved by the Owner, Contractor and Design Professional. Supplemental Instruction for a minor change in the Work, will not create cost or time effect on the Project in accordance with Subparagraph 7.4.1, and may be issued only by the Design Professional.

7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the, Modification / Change Request or Supplemental Instruction.

7.2 MODIFICATON / CHANGE REQUEST

7.2.1 A Modification / Change Request or MCR (Exhibit D-1) is a written document that may be initiated by the Contractor, Design Professional or Owner that identifies why there is a potential change in the Work that may require an adjustment, to the Contract Sum or Contract Time, or both, and suggests how that the change should take place. Following the initiation of a MCR by one of the parties, the Owner:

1. must agree to MCR's content and feasibility and if in agreement may authorize the MCR to; proceed with estimates of costs only; or proceed with the Work with estimates of costs to follow in accordance with Subparagraph 7.2.4;
2. will consider proposal(s) from the Contractor in accordance with Article 7 for adjustment to Contract Sum or Contract Time, if any; and,
3. shall authorize the Work to proceed if not previously authorized in accordance with Subparagraph 7.2.4 and authorize adjustment to Contract Sum in accordance with Paragraph 7.2 or, shall reject the MCR and replace with another or, stop all action on the MCR.

7.2.1.1 A MCR is required for any modification or change in the Work that:

1. may affect the Contract Sum or Time;



2. alters the Work by substitution or any other way not considered minor as defined by Paragraph 7.4; or,
3. otherwise materially affect the Work or intended function of the Project including a change to aesthetics.

7.2.1.2 A MCR when finalized by Owner approval, may modify the Contract without invalidating the Contract and may order changes in the Work within the general scope of the Contract with Contract Sum and Contract Time. Owner approval of a MCR:

1. shall adjust the Contract Sum accordingly; and,
2. will begin Owner consideration of related adjustment to Contract Time, if any;
3. and shall be included into a Change Order upon approval of the parties in accordance with Paragraph 7.3.

7.2.2 A MCR shall be used to:

1. approve a modification or change to the Work;
2. accumulate data such as cost and time impacts before authorizing a modification or change to the Work;
3. direct Work to be done with cost, time, etc. to follow in the absence of total agreement on the terms of a modification or change to the Work or to prevent delay of the Work; and,
4. stop all action on a proposed modification or change to the Work.

7.2.3 If Work defined by a MCR requires an adjustment to Contract Sum or Contract Time, the Contractor shall, within **ten (10) days** of the date of Owner issuance of MCR or delivery of MCR to Contractor if that date is later, prepare and deliver to the Design Professional a proposal for such adjustment based on:

1. unit prices or lump sum allowances stated in the Contract Documents;
2. unit price or lump sum determined in accordance with Subparagraph 7.2.5;
3. provision in the MCR as determined by the Owner and in accordance with Subparagraph 7.2.5; or,
4. a manner agreed upon by the parties and consistent with Subparagraph 7.2.5 and these General Conditions.

7.2.4 Upon receipt of a Modification / Change Request authorized by the Owner to "Proceed with the Work with costs to follow", the Contractor shall consider the MCR a directive and promptly proceed with the change in the Work involved and, provide a proposal for adjustment to Contract in accordance with Subparagraph 7.2.3.

7.2.5 Allowable Costs and Fees: If a proposal to adjust the Contract Sum exceeds \$200 and if not otherwise provided in the MCR or Contract Documents, the Contractor, shall provide an itemized accounting* together with appropriate supporting data that include :

1. quantities and unit costs of materials, including cost of transportation, whether incorporated or consumed;



2. quantities and unit costs of labor, including labor burdens such as social security and unemployment insurance, fringe benefits such as health insurance required by agreement or custom (Labor Burdens shall not include retirement plans qualified by minimum employment time, organizational fees or dues, legal or related expenses, information technology training and the like);
3. quantities and unit utilization or rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
4. quantities and unit costs of on-site supervision and field office personnel directly attributable to the change;
5. quantities and unit costs of and insurance, use tax or similar related to the Work;
6. Overhead and Profit**;
7. quantities and unit premiums for all bonds costs and permit fees on items 1 through above; and,
8. State Gross Receipts Tax (GRT); and,

* If pricing compounds, the compounding order shall be the same as listed items 1 - 8 of this Sub-paragraph.

** Overhead and Profit (O&P), a fixed amount that may include, but is not limited to, project management, main office expenses, computers, minor tools and incidentals, may be added on top of items 1 through 5 above, provided that combined they do not exceed the following:

Subtotal before applying overhead and profit	Under \$2000	\$2000 to \$10,000	\$10,001 to \$50,000	Over \$50,001
Contractor - For work performed by own forces	18%	16%	14%	12%
Contractor - For subcontracted work.	11%	9%	6%	5%
For work performed by 1 st tier Subcontractor	18%	15%	12%	9%
For work performed by 2 nd tier Subcontractor	10%	8%	5%	4%
Subcontractor - Maximum aggregate O&P allowed over cost regardless of number of tiers.	29%	24%	18%	14%
Exception: In extraordinary circumstances, the Owner may allow adjustment to the above maximums.				

7.2.5.1 Time-and-Material: If for the purpose of authorizing Work to proceed upon issuance on an MCR prior to the Owner receiving proposal of costs, so that labor or material costs are to be



accumulated for later inclusion into a proposal to adjust the contract sum, the MCR must clearly state conditions and limitations of time-and-material work to proceed under the change in Work with costs to follow provision of the MCR. At a minimum, the MCR shall state the maximum allowable cost. In addition, the Daily Job Report must reflect all appropriate detail on related Work, such as work performed that day, number of workers, materials received and similar. A separate daily worker log must also be maintained that will be included in the proposed cost of the MCR. The daily worker log for each MCR, must list each worker, the type of work performed and the hours worked, and must be

signed-off daily by an individual, agreed upon in the MCR, that may be the Project Superintendent. In accordance with this Paragraph 7.2, proposal of costs shall be delivered by the Contractor within Ten (10) days of issuance of MCR.

7.2.5.1.1 Reimbursement for Utility and Impact Fees: Owner may require Contractor to pay local government impact fees and/or fees to utilities as necessary for the project. Such fees shall be reimbursed to Contractor at cost plus two percent (2%).

7.2.5.2 Audit: The Owner shall be entitled to audit the books and records of a Contractor or any Subcontractor for any time-and-material or negotiated cost, such as those associated with a change in the Work, to the extent that such books and records relate to the proposal or performance of such Work. Such books and records shall be maintained by the Contractor for a period of three years from the date of final payment under the prime Contract and by the Subcontractor for a period of three years from the date of final payment under the subcontract, unless a shorter period is otherwise authorized in writing (13-1-16, NMSA 1978).

7.2.6 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Design Professional. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

7.2.7 A proposed adjustment to Contract Sum and Contract Time submitted by Contractor for a MCR indicates agreement of the Contractor therewith for the proposed Modification. The Design Professional shall make recommendation to the Owner on the appropriateness of the proposed adjustment. The Owner may, after evaluation of the proposal and review of the Design Professional's recommendation, accept the Contractor's proposed adjustment to Contract Sum and finalize the MCR. If Owner approves MCR, it shall be recorded for inclusion into a Change Order.

7.2.8 If the Contractor does not respond promptly with a proposal for adjustment to Contract Sum and Contract Time relative to an MCR or disagrees with the method for adjustment, or; if there are amounts or terms in dispute for such changes in the Work; the Design Professional on the basis of reasonable expenditures or savings of those performing the Work attributable to the change in the Work shall make a determination for purpose of settlement of dispute. That determination of adjustment to the Contract Sum and Contract Time shall be presented to the Owner and the Contractor for consideration. If the Owner or the Contractor do not agree with the Design Professional's determination, the provisions of Subparagraph 7.2.9 shall apply. When the Owner and Contractor agree with the determination made by the Design Professional concerning the adjustments



in the Contract Sum, such agreement shall be effective immediately upon Contractor's acceptance in writing and Owner's approval of MCR.

7.2.9 The Owner shall, within **fifteen (15) days** of the determination made by the Design Professional regarding adjustment to Contract Sum or Contract Time in accordance with Subparagraph 7.2.8, either:

1. accept the Design Professional's determination and, approve the MCR with the adjustment recommended by the Design Professional and record the MCR as approved by the Owner to be included into a Change Order; or
2. approve the MCR with an adjustment the Owner determines to be appropriate based on available information and record the MCR as approved by the Owner to be included into a Change Order.

Adjustment to Contract Sum in accordance with this Subparagraph 7.2.9 shall be subject to the right of Contractor to disagree and assert a claim in accordance with Paragraph 4.3.

7.2.10 Partial agreement of an adjustment to Contract Sum or Contract Time relative to a MCR may be allowed by the Owner only if adjustment to Work, requested by the MCR, can be subdivided into independent parts. In the event of such subdivision; MCR shall be broken into separate parts with alpha suffixes such as MCR 2A, MCR 2B and so on.

7.2.11 Periodically, approved MCR's shall be accumulated by the Owner or Design Professional into a Change Order in accordance with Paragraph 7.3.

7.3 CHANGE ORDERS

7.3.1 A Change Order (Exhibit D-2) is a written instrument prepared by the Design Professional and signed by the Owner, Contractor and Design Professional, stating their agreement upon:

1. change in the work as made by finalized Modification / Change Request(s) that has been previously approved by the Owner or authorized in accordance with Sub-paragraphs 7.2.8 or 7.2.9.;
2. amount of the adjustment, if any in the Contract Sum resultant of approved MCR(s);
3. extent of the adjustment, if any, in the Contract Time related to approved MCR(s); or,
4. if disagreement on adjustment in the Contract Time, parties agree to postponement of inclusion of any adjustment to Contract Time into a Change Order; however, all Contractor proposed or Owner offered adjustment(s) to time shall be incorporated into a Change Order prior to Substantial Completion in accordance with Subparagraph 9.8.6.

POSTPONEMENT OF ADJUSTMENT TO CONTRACT TIME LANGUAGE:

"At the time of this Change Order, there is no agreement on adjustment to the Contract Time related to MCR(s) XX, XX, XX and XX. The Contractor, without prejudice and without waiving any rights to such claim for adjustment to Contract Time in relation to these MCR(s), agrees to postpone claim in accordance with Paragraph 7.3 of the General Conditions."

7.3.2 Methods used in determining adjustments to the Contract Sum include those listed in



Paragraph 7.2. Proposals submitted that do not follow the requirements under Paragraph 7.2 will be returned to be resubmitted prior to processing.

7.3.3 Individuals Authorized to Make Changes: All Change Orders must be approved and signed on behalf of Owner by the Director, Facilities Design and Construction or Director's designee.

7.4 MINOR CHANGES IN THE WORK

7.4.1 The Design Professional will have authority to order Supplemental Instructions for minor changes in the work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8 TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

8.1.2 The date of commencement of the Work is the date established in the Agreement.

8.1.3 The date of Substantial Completion is the date certified by the Design Professional in accordance with Paragraph 9.8.

8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.2 PROGRESS AND COMPLETION

8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by the Contract Documents, a Notice to Proceed shall be given by the Owner that shall establish the commencement of the Contract Time as provided by the Contract Documents.



8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

8.2.4 The Owner shall not be liable to the Contractor for additional time or money if the Contractor submits a progress report or construction schedule expressing an intention to achieve completion of the Work prior to the Contract Time and then is not able to achieve intended accelerated schedule regardless of the reason.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Design Professional, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner pending mediation and arbitration, or by other causes which the Design Professional and the Owner determine may justify delay, then the Contract Time shall be extended by Modification in accordance with Article 7 for such reasonable time as the Design Professional in concurrence with the Owner may determine.

8.3.2 Extensions of time not associated with modifications or changes to the Work shall not be allowed to increase the Contract amount for overhead or for any other reason and shall strictly apply toward liquidated damages.

8.3.3 Claims relating to time shall be made in accordance with applicable provisions under Paragraph 4.3.

8.4 CONTRACT TIME AND LIQUIDATED DAMAGES

8.4.1 The Contractor agrees that the Work will be prosecuted regularly, diligently and without interruption at such rate of progress as will ensure completion within the Contract Time. It is expressly understood and agreed, by and between the Contractor and the Owner, that the Contract Time is a reasonable time for completion of the Work, taking into consideration the average climate range and usual industrial conditions prevailing in the locality of the Project. If the Contractor neglects, fails or refuses to complete the Work within the Contract Time, or any proper extension granted by the Owner, then the Contractor agrees to pay the Owner the amount specified in the Contract Documents, not as a penalty, but as liquidated damages.

8.4.2 The parties agree that the amount of the likely damage to the Owner for such delay is difficult to ascertain at the time of execution of this Agreement, but that a reasonable estimate of such damages for delay is set forth in the contract Documents. Liquidated damages may be deducted from any monthly progress payments due to the Contractor or from other monies being withheld from the Contractor when a reasonable estimate of expected Substantial Completion can be determined by the Owner.

8.4.3 Final accounting of Liquidated Damages shall be determined at Substantial Completion and



the Contractor and Surety are liable for any liquidated damages over and above unpaid balance held by the Owner.

ARTICLE 9 PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Design Professional a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Design Professional may require. Support data shall include accounting of all Project costs distributed to Level 2 UniFormat™ convention. The schedule of values, upon acceptance by the Design Professional with the Owner's prior approval, shall be used as a basis for reviewing the Contractor's Application for Payment.

9.2.1.1 Gross Receipts Tax shall be included as a separate line item of the Schedule of Values. In the event of a GRT rate change, the Contractor shall submit an MCR requesting an adjusted amount on balance to complete the Contract.

9.2.2 To protect the Owner from the significant liability and arduous accounting efforts required by lingering documentation and close-out work, the Schedule of Values shall provide a separate line item titled "Documentation and Close-Out" to provide a value consistent with and appropriate to required documentation provisions throughout the Contract including those required by Subparagraph 9.10. The value of the Documentation and Close-Out line item shall not be less than the following:

For a total Contract amount excluding tax of:	Documentation and Close-Out amount
--	---------------------------------------



less than \$20,000	\$0
20,001 - 75,000	6,000
75,001 - 100,000	8,000
100,001 - 200,000	10,000
200,001 - 350,000	15,000
350,001 - 500,000	25,000
501,001 - 1,000,000	50,000
1,000,001 - 1,500,000	70,000
1,500,001 - 2,000,000	90,000
2,000,001 - 3,000,000	120,000
for each additional million	add 30,000

9.2.2.1 If requested in writing by the Contractor, and in the sole opinion of the Owner, the Contractor is in full compliance with the documentation requirements of the Contract, the Documentation and Close-Out Schedule of Value line item may be reduced each month prior to Substantial Completion up to five percent (5%) of the originally scheduled amount or one thousand dollars (\$1,000), whichever is greater, providing that the Documentation and Close-Out line item is not reduced to less

than fifty percent (50%) of the original amount required until which time that Close-Out is complete as required by Paragraph 9.10.

9.2.3 Progress Payment Draw-down Schedule: To facilitate Owner's financial planning, Contractor shall complete **Exhibit C**, Estimated Monthly Draw-down Schedule, to provide an estimate of cash draws for each individual month during the life of the project.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 No later than the 25th of each month, the Contractor shall submit to the Design Professional an itemized Application for Payment for operations completed in accordance with the Schedule of Values for that month. Such application shall be supported by such data substantiating the Contractor's right to payment as the Owner or Design Professional may require such copies of requisitions from Subcontractors and material suppliers. No Applications for Payment will be processed until the initial Schedule of Values is received and approved by Design Professional with concurrence from the Owner and for subsequent payment applications; the Project Schedule has been updated in accordance with Subparagraph 3.10.1.

9.3.1.1 No Application for Payment may include more than:

1. ninety-five percent (95%) of the scheduled value of any work requiring testing prior to testing and verification of testing by the Design Professional to meeting requirements of the Contract Documents;
2. ninety percent (90%) of the scheduled value for systems that require, as a part of acceptance



of the Work, testing or balancing including, but not limited to, mechanical heating, air-conditioning and electrical distribution until testing, balancing or other verification required by the Contract Documents has been completed and verified as acceptable by the Design Professional.

9.3.1.2 Such applications may not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation into the Work. Any payments for such materials or equipment shall be conditioned upon the Contractor's demonstration that they are adequately protected from weather, damage, vandalism and theft and that such materials or equipment have been inventoried and stored in accordance with procedures established by or approved by the Owner. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing and with sufficient Contractor provided insurance against loss, and with Owner named as co-insured, to cover the value of stored materials and their transport to the Project.

9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been

previously issued and payments received from the Owner shall be free and clear of claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, material suppliers and equipment relating to the Work. The Contractor additionally warrants that all As-Built drawings accurately depict completed Work covered by an Application for Payment, inclusive of all trades and inclusive of, but not be limited to, actual locations and installed types, brand, model number and similar of all Work including ducts, pipes, conduit, equipment, walls and site utilities.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 Application for Payment must be submitted to the Design Professional no later than the 25th of the month for which the application is being made. The Design Professional will review with the Owner the accuracy and appropriateness of the application and, within **five (5) days** after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Design Professional determines is properly due, or notify the Contractor and Owner in writing of the Design Professional's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1.

9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Design Professional to the Owner, based on the Design Professional's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Design Professional's knowledge, information and belief, the quality of the Work is



in accordance with the Contract Documents and that As-Built drawings are current to actual Work completed. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Design Professional. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified.

9.4.3 The Owner will issue payment to the Contractor in the amount certified in the approved Certificate for Payment within **twenty-one (21) days** from the end of the progress payment period which shall be the end of the month for which the Certificate of Payment is made.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1 The Design Professional may withhold a Certificate for Payment and may assess Liquidated Damages in accordance with Paragraph 8.4, in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Design Professional's opinion the representations to the Owner required by Subparagraph 9.4.2 cannot be made. If the Design Professional is unable to certify payment in the amount of the Application, the Design Professional will notify the Contractor and Owner as provided in Subparagraph 9.4.1. If the Contractor and Design Professional cannot agree on a revised amount, the Design Professional will promptly issue a Certificate for Payment for the amount for which the Design Professional is able to make such representations to the Owner. The Design Professional may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Design Professional's opinion to protect the Owner from loss for which the Contractor is

responsible, including loss resulting from acts and omissions described in Subparagraph 3.3.2, because of:

1. defective Work not remedied;
2. third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
3. failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
4. reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
5. damage to the Owner or another contractor;
6. reasonable evidence that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
7. persistent failure to carry out the Work in accordance with the Contract Documents.

9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.6 PROGRESS PAYMENTS



9.6.1 After the Design Professional has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents.

9.6.2 The Contractor shall promptly pay each Subcontractor and supplier, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained, , if any, from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments in a similar manner. It is the Contractor's responsibility to comply with § 57-28-5(C) of the New Mexico Retainage Act, requiring Contractors to make prompt payment to Subcontractors for work performed within **seven (7) days** after receipt of payment from the Owner or pay interest for failing to make prompt payment.

9.6.3 The Design Professional will on request, furnish to a Subcontractor information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Design Professional and Owner on account of portions of the Work done by such Subcontractor.

9.6.4 Neither the Owner nor Design Professional shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law.

9.6.5 Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3 and 9.6.4.

9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.6.7 Payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, or create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

9.7 FAILURE OF PAYMENT

9.7.1 If the Owner does not pay the Contractor the amount approved by the Design Professional or the Design Professional does not approve the application for payment then, within **forty-five (45) days** from the end of the progress payment period, Contractor may, upon **seven (7) additional days** written notice to the Owner and Design Professional, stop the Work until payment of the amount owing has been received. Unless Contractor's action was improper or if the amount claimed is shown not to have been due, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus



interest as provided for in the Contract Documents. In the event of a wrongful Stop-Work, the Contractor shall remain responsible to the Owner for delivering the Project in accordance with the Contract Documents.

9.7.2 Incomplete or Disputed Invoices: If Owner, through its project representative or through the Design Professional, determines that an invoice is improperly completed, then within seven (7) business days after receipt, Owner will notify Contractor of the way in which the invoice is improperly completed. Following such notice, Owner shall have no further duty to pay the improperly completed invoice until it is resubmitted in properly completed form.

9.7.3 In the event Owner pays an invoice and the Work for that invoice is subsequently determined by the Design Professional or Owner to be not in compliance with the Contract Documents, then the next invoice shall be adjusted to account for the non-complying work. Payment by Owner shall not constitute acceptance of Work subsequently determined to be not in compliance with the Contract Documents.

9.7.4 Prompt Payment of Complete, Undisputed Invoices: If Owner does not dispute or question the invoice, then Owner shall pay Contractor the full amount of the invoice within twenty-one (21) days of receipt of the undisputed Progress Payment invoice, and if Owner fails to do so, then Owner shall pay Contractor interest, as required by the Prompt Payment Act, from the twenty-second (22nd) calendar day after said receipt at the rate set forth from time-to-time in the Prompt Payment Act until the payment is issued. Nothing in this Agreement shall be construed as requiring Owner to pay interest on disputed amounts or on Contractor claims.

9.7.5 Set-Offs: Owner shall have the right to set off any amounts which may become payable to Contractor under this Agreement, against any amounts which Contractor may owe Owner, whether under this Agreement or otherwise.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is complete and in compliance with the Contract Documents except for minor items so that the Owner can completely occupy or fully utilize the Work for its intended use. Owner's Occupancy under conditional approval by public authorities having jurisdiction over the Work, or occupancy of a facility or otherwise utilizing the Work under duress, shall not be considered Substantial Completion.

9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall promptly prepare and submit to the Design Professional a comprehensive Contractor's Punch List inclusive and all incomplete and non-compliant Work to be completed or corrected prior to final payment, as well as, the requirements of Subparagraph 9.10.2.

9.8.3 The Contractor shall submit along with the punch list a separate and detailed schedule



indicating the date of Final Completion and all work to be completed before Final Completion including Close-Out requirements as provided in Paragraph 9.10. Failure to include any item on punch list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

9.8.4 Upon receipt of the Contractor's Punch List and Closeout Schedule, the Design Professional will within **ten (10) days** make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Design Professional's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof, as it is fully intended and designed to be used, the Contractor shall complete or correct such item upon inspection by the Design Professional to determine Substantial Completion. In the event the Work does appear Substantially Complete, the Design Professional will review the Contractor's Punch List for completeness required for issuance of Substantial Completion. The Contractor shall be responsible for cost of excessive Design Professional time and effort in completing list of incomplete and non-compliant Work not included in Contractor's Punch List or otherwise due to Contractor's neglect of responsibilities of Subparagraph 9.8.2.

9.8.5 When the Work or designated portion thereof is substantially complete, the Design Professional will prepare a Certificate of Substantial Completion (Exhibit E), with the Owner's prior approval, which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate in accordance with Subparagraph 9.8.2..

9.8.6 Warranties shall be in accordance with this Subparagraph 9.8.6 and Paragraph 12.2 and shall include all components and equipment required by the Contract Documents. All Work shall be warranted for the greater of:

1. a minimum of one (1) year from the date of Substantial Completion;
2. one (1) year from the date of first installation in accordance with Subparagraph 12.2.2.2;
3. one (1) year from the date of replacement due to failure such that; each component of the Work must not fail for a one (1) year period regardless of the date of Substantial Completion;
4. that required by the Contract Documents; or,
5. that provided in the Certificate of Substantial Completion that will become an addendum to the Contract.
6. Refer to the roofing specifications for additional roofing warranty requirements.

Owner and Contractor may, by mutual agreement, amend the Contract at Substantial Completion to include Performance Bonding, extended warranty, on-site maintenance, subsequent testing, scheduled replacement or other mutually agreeable terms.

9.8.7 Any postponement(s) of inclusion(s) of adjustment(s) to Contract Time in accordance with Subparagraph 7.3.1.4 shall be included into a MCR for agreement and then into a Change Order prior to Certificate of Substantial Completion. If the Contractor and the Owner do not agree on Contractor



proposal, the Design Professional on the basis of evidence that critical path of work flow was reduced or expanded attributable to the change(s) in the Work with evidence being differences in Contractor's initial and current schedules and other evidence, shall make an determination for purpose of settlement of dispute. That determination of adjustment to the Contract Time shall be presented to the Owner and the Contractor for consideration. When the Owner and Contractor agree with the determination made by the Design Professional concerning the adjustments in the Contract Time such agreement shall be effective immediately, upon Contractor's written approval, and shall be recorded by preparation and execution of an appropriate MCR that shall be approved by the Owner. If after **five (5) days** the Owner or Contractor cannot agree with the determination made by the Design Professional regarding adjustment to Contract Time, then the Design Professional may order the preparation and execution of an appropriate MCR and:

1. if the Contractor is in disagreement, the MCR shall be recorded as approved by the Owner to be included in a Change Order;
2. if the Owner is in disagreement, the MCR shall be recorded as "approved by dispute resolution authority of the Design Professional" in accordance with this Subparagraph 9.8.6 to be included into a Change Order; and,
3. either approval shall be subject to the right of either party to disagree and assert a claim in accordance with Article 4.

9.8.8 Liquidated Damages shall be determined in accordance with Paragraph 8.4.

9.8.9 The Certificate of Substantial Completion shall be submitted to the Contractor and Contractor shall submit for consent of surety, if required, for written acceptance and following acceptance, the Owner shall make payment to Substantial Completion. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage provided such occupancy or use is consented to by the insurer as required under Clause 11.4.1.3 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have communicated in writing the responsibilities for payments, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties, if different from the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Design Professional as provided under Subparagraph 9.8.2. The stage or the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, then by decision of the Design Professional.

9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Design Professional shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.



9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of work not complying with the requirements of the Contract Documents.

9.10 CLOSE-OUT REQUIREMENTS

9.10.1 Before final completion in accordance with Paragraph 9.11 can be achieved all Work must be complete and accepted including the requirements under Paragraph 9.10 including:

1. Work associated with Punch List(s);
2. testing, balance or performance operations complete and in agreement that associated work is in compliance with the Contract Documents and verified as such by the Design Professional;
3. one hard copy and one electronic copy in .pdf format of final approved test, balance or performance report(s) complete with directory of contents submitted to Owner, if provided by Contractor;
4. Operation and Maintenance Manuals complete and verified as such by the Design Professional;
5. Owner sign-off of receipt of O&M Training on proper use, care and operation of all systems or components as required by the Contract Documents;
6. two hard copy sets and one electronic copy in .pdf format of final approved Operation and Maintenance Manuals with directory of contents submitted to Owner;
7. As-Built drawings provided for conversion to accurate Record Drawings and verified as such by the Design Professional using information provided by the Contractor and by other knowledge the Design Professional may possess;
8. written certification signed by Owner of delivery and stocking of extra material, equipment or components required by the Contract Documents at a location established by the Owner;
9. delivery of all warranties required by the Contract Documents;

10. all keys, passes, codes, software or other methods or components of control or security have been correctly and adequately accounted for and closed-out.

9.10.2 The Contractor shall prepare a separate Close-Out Punch List listing all requirements of Subparagraph 9.10.1 and the status of each, whether completed or not and the expected completed date of each component of the list. The Close-Out Punch List shall be a separate part and a subset of the Contractor's Punch List required for Substantial Completion in accordance with Subparagraph 9.8.2. At completion of the List, the Contractor shall state in writing to the Design Professional that the Close-Out Punch List has been completed and request a Close-Out Meeting with the Design Professional and the Owner. The Design Professional shall schedule such meeting within **ten (10) days** of the request, or otherwise reply in writing to the Contractor why the request is pre-mature. At the Close-Out Meeting, all requirements to achieve close-out will be verified, and if Work is found to be complete, the Design Professional, with concurrence from the Owner, shall provide written approval of Contractor's completion of close-out requirements within **five (5) days** of the conclusion of the meeting.



9.10.3 The balance at Substantial Completion of the Schedule of Values line item for Documents and Close-Out in accordance with Subparagraph 9.2.2 shall only be approved for payment when all requirements under Paragraph 9.10 are complete. No partial payment of the Close-Out balance will be considered. Contractor agrees that Close-Out Requirements, in accordance with Paragraph 9.10, are part of the value of Work defined by the Contract Documents and shall not be construed to mean retainage. Any variation or deviation from this Paragraph 9.10 shall be made through an appropriate Modification in accordance with Article 7.

9.10.4 The Contractor shall be responsible for cost of excessive Design Professional time and effort related to failure of Contractor to achieve Closeout Schedule provided in accordance with Subparagraph 9.8.3, as determined by Owner.

9.11 FINAL COMPLETION AND FINAL PAYMENT

9.11.1 Following completion of close-out requirements in accordance with Paragraph 9.10, and upon receipt of a written notice from the Contractor that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Design Professional will promptly make such inspection and, when the Design Professional finds the Work acceptable under the Contract Documents and the Contract fully performed, the Design Professional will promptly, with the Owner's prior approval, issue a Certificate of Final Completion (Exhibit F) and following approval by all parties, a final Certificate for Payment each stating that to the best of the Design Professional's knowledge, information and belief and on the basis of the Design Professional's or Design Professional's Project Representative's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Design Professional's issuance of Certificate of Final Completion and final Certificate for Payment will constitute a further representation that conditions listed in Subparagraphs 9.10 and 9.11.2 have been fulfilled as precedent to the Contractor's being entitled to final payment.

9.11.2 Final payment shall not become due until the Contractor submits to the Design Professional:

1. an affidavit that payrolls, bills for subcontracts, materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied;
2. a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least **forty-five (45) days** prior written notice has been given to the Owner;
3. a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents;
4. consent of surety, if any, to final payment;
5. releases and waivers of claims of all Subcontractors, and suppliers; and,
6. if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers, claims, security interests or encumbrances arising out of the



Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor or other entity refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify and protect the Owner.

If any claim remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such claim, including all costs and reasonable attorney's fees.

9.11.3 If, after Substantial Completion of the Work, Final Completion thereof is materially delayed through no fault of the Contractor or by issuance of changes in the Work affecting Final Completion, and the Design Professional so confirms, the Owner shall, upon application by the Contractor and certification by the Design Professional, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Design Professional prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

9.11.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

1. Claims, security interests or encumbrances arising out of the Contract and unsettled;
2. failure of the Work to comply with the requirements of the Contract Documents; or
3. terms of special warranties required by the Contract Documents.

9.11.5 Acceptance of final payment by the Contractor, a Subcontractor or supplier shall constitute a waiver of Claims by that payee, except those previously made in writing and identified by the payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract. The Owner may, but is under no obligation, point out unsafe conditions or operations.

10.1.2 The Contractor shall at all times conduct operations and take precautions under this Contract in a manner to avoid risk or bodily harm to persons on or around the Work site and to avoid risk of damage to any property. The Contractor shall continuously inspect the construction operations and shall cause Subcontractors and all other entities on or around the Project to be aware of dangers or risks and to comply with applicable health or safety laws, codes, standards and regulations applicable to the locale where the Project is located.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable



protection to prevent damage, injury or loss to:

1. employees on the Work and other persons who may be affected thereby and shall include clean work site, well maintained equipment, barricades, safety awareness programs or whatever effort that will best accomplish required protection;
2. students, staff and public either nearby or within the Project site that shall include re-routing pedestrian ways, re-routing traffic, providing signage, building of bridges, barricades, pedestrian tunnels, or whatever effort that will best accomplish required protection;
3. Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors; and
4. other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Subparagraphs 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible, except damage or loss attributable to acts or omissions of the Owner or Design Professional or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations stated throughout the Contract Documents.

10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent, unless otherwise designated by the Contractor in writing to the Owner and Design Professional.

10.2.7 The Contractor shall report in writing to the Owner and the Design Professional within **five (5) days** of an accident arising out of or in connection with the Work which caused lost time injury, personal injury, death or property damage, giving full details and statements of any witnesses. In cases



of serious bodily injury, death or serious property damage, Contractor shall immediately contact the proper authorities, as well as, Owner and Design Professional by the most expeditious means.

10.2.8 Accident Reporting. In case of an accident involving Contractor, its subcontractors, or the Work, an investigative report shall be prepared by Contractor and one copy thereof given to Owner within twenty-four (24) hours of the occurrence of the accident. Verbal notification of any serious injury that may require overnight hospitalization or fatal injuries shall be provided within one (1) hour of the injury.

10.3 HAZARDOUS MATERIALS

10.3.1 If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and immediately report the condition to the Owner and Design Professional in writing.

10.3.2 The Owner shall obtain the services of a properly licensed testing laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to obtain the services of a remediation contractor to remove the hazard and to verify that it has been rendered harmless. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. The Contract Time adjusted as provided in Article 7. "Rendered Harmless" shall mean that the levels of such materials are less than any applicable exposure levels, including but not limited to EPA regulations.

10.4 The Owner shall not be responsible under Paragraph 10.3 for materials and substances brought to the site by the Contractor.

10.5 If, without negligence on the part of the Contractor, the Contractor is held liable for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Contract shall be equitably adjusted in accordance with Article 7.

10.6 EMERGENCIES

10.6.1 In an emergency affecting safety of persons or property, the Contractor shall use its best efforts to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency, shall be determined as provided in Paragraph 4.3 and Article 7.

10.7 Liability for Property Damage: Contractor shall continuously maintain adequate protection of Work from damage and shall at all times protect Owner's property, including materials furnished by Owner, from injury or loss. Contractor shall make good at its own expense any such damage, injury, or loss that may result from its effort in connection with the Work. Contractor shall provide all facilities for protection required by authorities having jurisdiction. Contractor shall be liable to Owner and its affiliates for any loss of or damage to the property of Owner and its affiliates resulting from Contractor's performance of the Work.



10.8 Trespass: Contractor shall be solely responsible for any act of trespass or any injury to adjacent property resulting from or in connection with Contractor's performance of the Work. Contractor shall be liable for any claims that may arise from the deposit of debris of any kind on adjacent property.

10.9 Underground Utility Facilities: Contractor shall be familiar with the requirements of the respective underground facility laws of the State of New Mexico. It shall be the Contractor's responsibility to locate all underground utility facilities in the Work site area including, but not limited to, tunnels and vaults for gas, electric, telephone, water, sanitary sewer lines, storm sewer lines, and the like, as well as to repair or pay for damage to these utility facilities. Contractor shall take the necessary steps to safeguard these underground utility facilities.

ARTICLE 11 INSURANCE AND BONDS

11.1 LIABILITY INSURANCE

11.1.1 The Contractor and Subcontractors shall purchase from and maintain in a company or companies lawfully authorized to transact insurance in New Mexico, insurance that shall protect the Contractor and Subcontractors from claims set forth below, which may arise out of or result from operations under the Contract and for which the Contractor and Subcontractors may be legally liable, whether such operations be by the Contractor and Subcontractors or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

1. claims under Workers' Compensation, Disability Benefit and other similar Employee Benefit Acts, which are applicable to the Work to be performed;
2. claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
3. claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
4. claims for damage for personal injury;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting there from;
6. claims for damages because of bodily injury, death of a person property damage arising out of ownership, maintenance or use of a motor vehicle;
7. claims for bodily injury or property damage arising out of completed operations; and
8. claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

Provision of insurance does not limit the liability of the Contractor under 3.18.1 herein.

11.1.2 The Contractor shall ensure that liability insurance is maintained in accordance with Article 11 and may, at Contractor's option, either insure the activities of Subcontractors or require them to maintain insurance to cover all claims in Article 11. If the Owner is damaged by the failure or neglect of the Contractor to maintain insurance as described above, then the Contractor shall be liable for all costs and damages properly attributable thereto.



11.1.3 The insurance required by Subparagraph 11.1.1 shall be written for not less than limits of liability specified herein or required by law, whichever coverage is greater. Coverage, shall be written on an occurrence basis and shall be maintained without interruption from the date of commencement of the Work until date of Final Payment and termination of any coverage required to be maintained after final payment.

11.1.4 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least **forty-five (45) days** prior written notice has been given to the Owner. If any of the foregoing insurance coverages are requested to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both shall be furnished by the Contractor with reasonable promptness.

11.1.4.1 The Certificates of Insurance shall clearly state the coverages, limits of liability, covered operations, effective dates and dates of expiration of policies of Insurance. The Contractor will promptly notify and furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits. The Certificates of Insurance shall be in the appropriate ACORD form, or similar format acceptable to the Owner and shall include the following statements:

1. "The *(the name of the Owner whose name appears on the Agreement)*, its agents, servants and employees are recognized as Additionally Insured."
2. "The insurance coverage certified herein will not be canceled or materially changed, except after **forty-five (45) days** written notice has been provided to the Owner"
3. "The insured will not violate, or permit to be violated, any conditions of this policy, and will at all times satisfy the requirements of the insurance company transacting the policy."
4. "The coverage provided by this certificate is primary."
5. "Nothing in this certificate of coverage will be construed to affect the Owner, agents, servants and employees defenses, immunities or limitations of liability under the New Mexico Tort Claims Act."

11.1.5 Minimum Required Coverages:

11.1.5.1 Worker's Compensation Insurance shall be provided as required by applicable State law for all employees engaged at the site of the Project under this Contract, including Subcontractor employees. In case any class of employee engaged in work on the Project under this Contract is not protected under the Worker's Compensation Statute, the Contractor shall provide, and cause each Subcontractor to provide Employer's Liability Insurance in an amount not less than five hundred thousand (\$500,000). Failure to comply with the conditions of this Subparagraph 11.1.5.1 will subject this Contract to termination.

11.1.5.2 Public Liability Insurance shall not be less than the liability amounts set forth in the New Mexico Tort Claims Act, §41-4-1 et seq. NMSA 1978, as it now exists or may be amended.



11.1.5.3 Comprehensive Vehicle Liability Insurance, for both owned and non-owned vehicles, shall be one million dollars (\$1,000,000) per occurrence combined single limit for both personal injury and property damage.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

11.3 (NOT USED)

11.4 PROPERTY INSURANCE

11.4.1 The Contractor shall provide insurance ("builder's risk") which will protect the interests of the Contractor and Subcontractors in the Work. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until Final Payment has been made as provided in Paragraph 9.11 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.4 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, and Subcontractors in the Project.

11.4.1.2 This property insurance may not cover portions of the Work stored off the site or any portions of the Work in transit. Insurance covering Work or materials stored off site shall be in accordance with sub-paragraph 9.3.2.

11.4.1.3 Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.4.2 Boiler and Machinery Insurance. The Owner shall purchase and maintain Equipment Breakdown Coverage if required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner, this insurance shall include interests of the Owner, Contractor and Subcontractors in the Work.

11.4.3 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

11.4.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if



possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Modification / Change Request Change Order.

11.4.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site, by property insurance under policies separate from those insuring through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive rights in accordance with the terms of Subparagraph 11.4.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

11.4.6 Before an exposure to loss may occur, the Contractor may review any Owner provided insurance required by this Paragraph 11.4. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least **thirty (30) days** prior written notice has been given to the Contractor.

11.4.7 Waivers of Subrogation. The Owner and Contractor waive all rights against each other and any of their subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Paragraph 11.4 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner. The Owner or Contractor, as appropriate, shall require of the Design Professional, Design Professional's consultants, separate contractors described in Article 6, if any, and the subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity that would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly,

and whether or not the person or entity had an insurable interest in the property damaged. The provisions of this paragraph shall not include claims with respect to damages to non-work buildings or properties

11.4.7.1. The provisions of Paragraph 11.4.7 shall not be effective as to a person or entity whose acts or failures to act cause the harm and rise to a level beyond mere negligence.

11.4.8 A loss insured under Owner's property insurance shall be adjusted by the Owner and made payable to the Owner for the insured's, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Subparagraph 11.4.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity.

11.4.9 The Owner shall distribute in accordance with such agreement as the parties in interest may agree, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.6. If after such loss, no other special agreement is made, and unless the Owner terminates



the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

11.4.10 The Owner shall have power to adjust and settle a loss with insurers.

11.5 PERFORMANCE BOND AND PAYMENT BOND

11.5.1 If the contract price exceeds \$25,000, the Contractor shall furnish Labor, Material and Performance surety bonds covering faithful performance of the Contract in amounts not less than 100 percent of the Contract amount, exclusive of GRT, unless Owner or the Contract Documents require a lesser percentage, for payment of obligations arising there under. These Labor, Material and Performance bonds shall be delivered to the Owner within **seven (7) days** of the Notice of Award or evidence satisfactory to the Owner that such bonds are forthcoming. Said bonds must comply with the requirements of §13-4-18, NMSA 1978. If the amount of the Sum of the Work is increased, the amounts of the bonds shall be increased accordingly.

Attach bonds as Exhibit G - Payment and Performance Bonds.

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

11.5.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 If a portion of the Work is covered contrary to the Design Professional's or Owner's request or to requirements specifically expressed in the Contract Documents, it must be uncovered for the Design Professional's and Owner's examination and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2 If a portion of the Work has been covered, which the Design Professional has not specifically requested to examine prior to its being covered, the Design Professional may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Modification in accordance with Article 7, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

12.2 CORRECTION OF WORK

12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION



12.2.1.1 The Contractor shall promptly correct Work rejected by the Owner or Design Professional or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such defective Work, including additional testing and inspections and compensation for the Design Professional's services and expenses made necessary thereby, shall be at the Contractor's expense.

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2.1 In addition to the Contractor's obligations under Paragraph 3.5, if within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Subparagraph 9.8.6, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one year period for correction of the Work, if the Owner fails to notify the Contractor and gives the Contractor an opportunity to make the correction, the Owner waives the rights to require the correction by Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within reasonable time during that period after receipt of notice from the Owner or Design Professional, the Owner may correct it in accordance with Paragraph 2.4.

12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work and in accordance with all other requirements of Subparagraph 9.8.6.

12.2.2.3 The one-year period for correction of Work shall be extended by corrective Work performed by the Contractor pursuant to this Paragraph 12.2 and Sub-paragraph 9.8.6.

12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.5 Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents or law. Establishment of the one-year period for correction of Work as described in Subparagraph 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be



sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.2.6 Eleven (11) months after Substantial Completion, the Design Professional shall coordinate, with the Owner and the Contractor, an 11-Month Correction Period Inspection of all portions of the Work. Any Work found defective or needing adjustment or other correction in order to function and operate in accordance with the indication of the Contract Documents shall be promptly completed by the Contractor within **twenty (20) days**, or as otherwise agreed between the parties. The Owner may make such corrections or adjustments in accordance with Paragraph 2.4.

Refer to the roofing specifications for additional post-construction inspections.

12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 LAW

13.1.1 The Contract shall be governed by the laws of the State of New Mexico and parties agree that the State of New Mexico District Court of the County, where the Project is located, shall have

exclusive jurisdiction to resolve all Claims, issues and disputes not otherwise resolved in accordance with the Contract Documents.

13.1.2 The Owner's total liability to Contractor or any other entity claiming by, through, or under Contractor for any Claim, cost, loss, expense or damage caused in part by the fault of the Owner and in part by the fault of the contractor or any other entity or individual shall not exceed the percentage share that Owner's fault bears to the total fault of Owner, Contractor and all other entities and individuals as determined on the basis of comparative fault principles.

.1 Owner's Disclaimer: Owner assumes no responsibility for any understanding or representations made by any of its officers or agents during or prior to the negotiation and execution of the Contract Documents, including but not limited to representations concerning site conditions, unless such understandings or representations are expressly stated in a Contract Document signed by Owner that expressly provides therein that responsibility for such expressly stated understanding or representation is assumed by Owner. Representations made but not so expressly stated and for which liability is not expressly assumed by Owner in the Contract Documents shall be deemed only for the information of Contractor, and Owner will not be liable or responsible therefor.



13.1.3 All Work shall be completed in accordance with and shall be inspected within requirements of the Construction Industries Licensing Act, Chapter 60, Article 13 NMSA 1978.

13.2 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.2.2 The Owner may, without consent of the Contractor, assign the Contract to an institutional lender providing construction financing for the Project. In such event, the lender shall assume the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

13.2.3 The Contractor shall not assign the Contract or proceeds hereof without written consent of the Owner. If contractor attempts to make such an assignment without such consent, it shall be void and confer no rights to third parties; the Contractor shall nevertheless remain legally responsible for all obligations under the Contract. Any consent of the Owner to such assignment shall be written and include "it is agreed that the funds to be paid to the assignee under this assignment are subject to performance by the Contractor and to claims for services rendered or materials supplied for the performance and of the Work and other obligations of the Contract Documents in favor of any entity rendering such services or providing such materials".

13.3 WRITTEN NOTICE

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was

intended, or if delivered at or sent by Registered or Certified Mail, Federal Express, or similar service with proof of delivery to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available there under, shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

13.4.2 No action or failure to act by the Owner, Design Professional or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval or acquiescence in a breach there under, except as may be specifically agreed in writing.

13.4.3 Contractor shall carry out the Work without delay in accordance with the Contract Documents during any and all disputes or disagreements, unless otherwise agreed to by the Owner in writing.



13.5 TEST AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided by Subparagraph 2.2.4 or elsewhere in the Contract Documents, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, provided by the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals unless otherwise provided in the Contract Documents. The Contractor shall give the Owner and Design Professional timely notice of when and where tests and inspections and approvals are to be made so that the Design Professional may be present for such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

13.5.2 If the Design Professional, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Subparagraph 13.5.1, the Design Professional will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Design Professional of when and where tests and inspections are to be made so that the Design Professional may be present for such procedures. Such costs, except as provided in Subparagraph 13.5.3, shall be at the Owner's expense.

13.5.3 If such procedures for testing, inspection, or approval under Subparagraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Design Professional's services and expenses shall be at the Contractor's expense.

13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Design Professional and to the Owner.

13.5.5 If the Design Professional is to observe tests, inspections or approvals required by the Contract Documents, the Design Professional will do so promptly and, where practicable, at the normal place of testing.

13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6 INTEREST

13.6.1 Payments due and unpaid undisputed amounts, under the Contract Documents, shall bear interest from the date payment is due in accordance with State statute regulating prompt payment.

13.7 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

13.7.1 As between the Owner and Contractor:

1. before Substantial Completion. As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;
2. between Substantial Completion and Final Certificate for Payment. As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment; and
3. after Final Certificate for Payment. As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act of failure to act by the Contractor pursuant to any Warranty provided under Subparagraph 9.8.5, Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

13.8 EMPLOYMENT**13.8.1 Equal Employment Opportunity**

13.8.1.1 The Contractor agrees not to discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin or other in accordance with U.S. Executive Order 11246, as amended, and NM Executive Order 85-15. The Contractor and Subcontractors agree to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of nondiscrimination. and shall in all solicitation or advertisement for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

13.8.1.2 If the Contract constitutes a federally assisted construction contract within the meaning of 41 CFR 60-1.3 (1987), then the equal opportunity clause of 41 CFR 60-1.4(b) is incorporated herein by reference.

13.8.2 Wage Rates

13.8.2.1 For Contracts in excess of \$60,000, minimum wages will be paid as determined by the Department of Workforce Solutions (formerly the Office of the Labor Commissioner) in accordance with §50-4-20 to 50-4-30 NMSA 1978, entitled "Minimum Wage Act" The Contractor and Subcontractors shall deliver or mail copies of the certified weekly payrolls, prepared in accordance with regulations, to the Labor Commission and to the Design Professional.

13.8.2.2 The scale of wages to be paid will be posted by the Contractor in a prominent and easily accessible place on the job site.

13.8.3 Apprentices

13.8.3.1 Except as otherwise required by law, the number of apprentices in each trade or occupation employed by the Contractor and Subcontractors, material suppliers and equipment suppliers shall not



exceed the number permitted by the applicable standards of the United States Department of Labor, or, New Mexico Construction Industries Division.

13.8.4 On-the-Job Relations with Contractor

13.8.4.1 The Contractor shall at all times have competent superintendent(s) or foremen on the job in immediate charge of the Work who shall receive communications from Design Professional or Owner in the prosecution of the Work, in accordance with the Contract Documents. Any person executing the Work, who in the opinion of the Design Professional or the Owner, appears to be incompetent or act in a disorderly or intemperate manner or violating provisions of the Contract Documents, shall upon written request, be immediately removed from the Project and not again be employed on any part of the Work. Failure to comply with this Subparagraph 13.8.4.1, shall upon the Owner's decision, be cause to immediately stop the Work in accordance with Paragraph 14.2.

13.8.5 Employee Background Checks

13.8.5.1 The Contractor shall be responsible for complying with the provisions of §22-10.3.3.B NMSA 1978, regarding employees' having unsupervised access to students. In the event that §22-10.3.3.B NMSA 1978 applies, and upon prior approval by the Owner, reasonable costs for background checks shall be reimbursed without mark-up or fee.

13.8.5.2 Reservation of Rights and Background Checks: Notwithstanding any other provisions to the contrary, Contractor shall provide workers skilled and specialized in the Work to which they are assigned. Owner reserves the right to require random drug testing and individual background checks of any employee of Contractor and subcontractors as necessary for the life, health and safety of school children. Owner will pay for such testing. **Contractor, by executing this Agreement, represents that no employee of Contractor, or subcontractors, is a convicted sex offender.**

Contractor and its subcontractors and agents shall perform security and background checks (including criminal history and sexual offender status), as well as drug and alcohol tests, for the purpose of determining a worker's suitability for the assignment. Such background checks and tests shall be at Contactor's expense. **Absolutely no worker with a sexual offender history shall be allowed to work on the subject project.**

13.8.5.3 Owner reserves all rights to deny placement of any of Contractor's workers, or any worker employed by any subcontractor or agent of the Contractor, on Owner's premises, property, equipment or projects at its sole discretion; however, Owner is not responsible for the conduct of Contractor's workers, which is the sole responsibility of the Contractor. Such denial of placement of subject workers shall be conveyed subject to the provisions of notices , and/or in a manner consistent with the normal custom between Owner and Contractor.

13.9 Records

13.9.1 In the even of a dispute between Owner and Contractor, the Owner shall have right to discovery and access to and the right to examine any accounting or other records of the Contractor involving transactions and Work related to this Contract for three (3) years after Final Payment or after final resolution of any disputes, whichever is later. The conditions of this paragraph apply



equally to Subcontractors and suppliers.

13.9.2 Records and Audits: Contractor shall maintain complete and accurate records concerning the Work and all related transactions for at least three (3) years from the date of Final Acceptance. This includes all records relating to compliance with applicable laws, compliance with a reasonable drug and alcohol policy, financial records related to the Work, employee qualifications and, to the extent applicable, U. S. Department of Transportation requirements. At any time but not later than three (3) years after final payment under this Agreement, Owner may make such audit of the records, invoices and substantiating material (including time records) as deemed necessary by Owner. Each payment made shall be subject to reduction and refund to Owner, or offset on future payments due Contractor, to the extent of amounts which are found by Owner not to have been properly payable or to have been overpaid, and shall also be subject to increase and payment to Contractor for underpayments to the extent of any amounts which are found by Owner to have been underpaid. Upon request by Owner, Contractor shall insert a clause containing all the provisions of this Article xxx, Records and Audits, in all subcontractors to permit Owner to make identical audits and inspections of the records of all subcontractors involved in performance of the Work.

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

13.11 No Third-party Beneficiaries: There are no third-party beneficiaries to this Agreement and no third person or entity shall claim that any portion of this agreement creates a duty running to that third person or entity.

13.12 Fair Labor Standards Act. 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, as amended, and regulations and orders pursuant thereto issued by the U.S. Department of Labor.

Article 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 Termination by the Contractor

14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of **thirty (30) consecutive days** through no act or fault of the Contractor or a Subcontractor or their agents or any other persons or entities performing portions of the Work under the contract with the Contractor, for any of the following reasons:

1. issuance of an order of a court or other public authority having jurisdiction which requires all



Work to be stopped;

2. an act of government, such as a declaration or national emergency which requires all Work to be stopped;
3. because the Design Professional has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Subparagraph 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
4. the owner has failed to furnish to the Contractor promptly, upon the Contractor's written request, reasonable evidence as required by Subparagraph 2.2.1.

14.1.2 The Contractor may terminate the Contract if, through no act or no fault of the Contractor or a Subcontractor or their agents or employees or any other persons or entities performing portions of the Work under contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Paragraph 14.3 constitute in the aggregate more than one hundred percent (100%) of the total number of days scheduled for completion, or **one hundred twenty (120) days** in any 365-day period, whichever is less.

14.1.3 If one of the reasons described in Subparagraph 14.1.1 or 14.1.2 exists, the Contractor may, upon **seven (7) days** written notice to the Owner and Design Professional, terminate the Contract and recover from the Owner payment for Work executed, including overhead and profit in accordance with Article 7 for Work performed, and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery excluding, overhead and profit.

14.1.4 If the Work is stopped for a period of **sixty (60) consecutive days** through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portion of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon **seven (7) additional days** written notice to the Owner and the Design Professional, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.3.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

1. refuses or fails to supply enough properly skilled workers or proper materials;
2. fails to make payment to Subcontractors for material or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
3. disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction;
4. disregards the authority of the Owner or Design Professional;
5. fails after commencement of the Work to proceed day-to-day continuously with the construction and completion of the Work for more than **ten (10) days**, except as permitted



under the Contract Documents;

6. fails to maintain owner approved schedule or owner approved recovery schedule; and,
7. otherwise is guilty of substantial breach of a provision of the Contract Documents.

14.2.2 When any of the above reasons exist, the Owner may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety notice, as required by the surety bonds, if any, **seven (7) days** written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

1. take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
2. accept assignment of subcontracts pursuant to Paragraph 5.4; and
3. finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

14.2.3 When the Owner terminates the Contract for one of the reasons stated in Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Design Professional's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owners as the case may be, shall be certified by the Design Professional, upon application, and this obligation for payment shall survive termination of the Contract.

14.2.5 In carrying out the Owner's right to complete the Work in accordance with Paragraph 14.2, the Owner shall have the right to exercise the Owner's sole discretion as to the manner, methods and reasonableness of costs of completing the Work.

14.3 SUSPENSION BY THE OWNER BY CONVENIENCE

14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Subparagraph 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

1. that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
2. that an equitable adjustment is made or denied under another provision of the Contract.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE



14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

1. cease operation as directed by the Owner in the notice;
2. take action necessary, or that the Owner may direct, for the protection and the preservation of the Work; and
3. except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing Subcontracts and Purchase Orders.

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work completed.

14.5 Survival of Obligations: Contractor's warranty obligations, compliance representations, indemnity obligations, and all performance obligations and guarantees, and indemnity obligations in the Contract Documents shall survive any termination of the Agreement, and the suspension, completion and acceptance of the Work, or any part thereof, or final payment to Contractor, it being agreed that said obligations and rights are and shall be of a continuing nature. The terms of Article 4.3, Claims and Disputes, shall also survive termination, suspension and completion of this Agreement.

14.6 Entire Agreement: The Contract Documents represent the entire agreement and understanding between Owner and Contractor with respect to the subject matter hereof and performance of the Work, and supercede any prior understandings, representations or agreements, whether verbal or written, prior to execution of this Agreement. If any Work was performed by 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.



LIST OF DRAWINGS

GENERAL	
G-001	COVER SHEET – INDEX OF DRAWINGS, PROJECT TEAM, SYMBOLS LEGEND
A-101	SCOPE OF WORK – PRIMARY CONTRACTOR SCOPE OF WORK – SEPARATE ON-CALL CONTRACTORS
ARCHITECTURAL	
A-100	OVERALL ROOF PLAN
A-101	DEMOLITION ROOF PLAN
A-102	DEMOLITION ROOF PLAN
A-103	DEMOLITION ROOF PLAN
A-141	REFLECTED CEILING PLAN
A-142	REFLECTED CEILING PLAN
A-143	REFLECTED CEILING PLAN
A-151	ROOF PLAN
A-152	ROOF PLAN
A-153	ROOF PLAN
A-154	ROOF REPAIR PLAN
A-551	ROOF DETAILS
A-552	ROOF DETAILS
A-553	ROOF DETAILS
MECHANICAL	
MP-001	MECHANICAL COVER SHEET
MD-111	MECHANICAL DEMOLITION PLAN
MD-112	MECHANICAL DEMOLITION PLAN
MD-113	MECHANICAL DEMOLITION PLAN
MD-151	MECHANICAL ROOF DEMOLITION PLAN
MD-152	MECHANICAL ROOF DEMOLITION PLAN

MD-153	MECHANICAL ROOF DEMOLITION PLAN
M-111	MECHANICAL PLAN
M-112	MECHANICAL PLAN
M-113	MECHANICAL PLAN
M-151	MECHANICAL ROOF PLAN
M-152	MECHANICAL ROOF PLAN
M-153	MECHANICAL ROOF PLAN
ELECTRICAL	
E-001	ELECTRICAL COVER SHEET
E-002	ELECTRICAL ONE-LINE DIAGRAMS
ED-111	ELECTRICAL DEMOLITION PLAN
ED-112	ELECTRICAL DEMOLITION PLAN
ED-113	ELECTRICAL DEMOLITION PLAN
ED-151	ELECTRICAL ROOF DEMOLITION PLAN
ED-152	ELECTRICAL ROOF DEMOLITION PLAN
ED-153	ELECTRICAL ROOF DEMOLITION PLAN
E-111	ELECTRICAL PLAN
E-112	ELECTRICAL PLAN
E-113	ELECTRICAL PLAN
E-151	ELECTRICAL ROOF PLAN
E-152	ELECTRICAL ROOF PLAN
E-153	ELECTRICAL ROOF PLAN

INDEX TO TECHNICAL SPECIFICATIONS

01		GENERAL REQUIREMENTS
01 1000	APS	SUMMARY OF WORK
01 2000	APS	PRICE AND PAYMENT PROCEDURES
01 2010	APS	MODIFICATION / CHANGE REQUEST (MCR) WORKSHEET
01 2300	APS	ALTERNATES
01 2301	APS	BID LOTS
01 3100	APS	PROJECT MANAGEMENT AND COORDINATION
01 3115	APS	PROJECT MANAGEMENT COMMUNICATIONS
01 3300	APS	SUBMITTAL PROCEDURES
01 3310	APS	SUBMITTAL TRANSMITTAL FORM
01 3510	APS	APS PROJECT PROCEDURES
01 4000	APS	QUALITY REQUIREMENTS
01 5000	APS	TEMPORARY FACILITIES AND CONTROLS
01 6000	APS	PRODUCT REQUIREMENTS
01 6300	APS	PRODUCT SUBSTITUTION PROCEDURES
01 6310	APS	PRIOR APPROVAL SUBSTITUTION REQUEST FORM
01 6320	APS	CONTRACTOR SUBSTITUTION REQUEST FORM
01 7000	APS	EXECUTION REQUIREMENTS
01 7500	APS	STARTING AND ADJUSTING
01 7700	APS	CLOSEOUT PROCEDURES
01 7800	APS	CLOSEOUT SUBMITTALS
01 7878	APS	ENERGY CONSERVATION CLOSEOUT SUBMITTALS
01 7900	APS	DEMONSTRATION AND TRAINING
01 9100	APS	GENERAL COMMISSIONING REQUIREMENTS
02		EXISTING CONDITIONS
02 4100	GTH	DEMOLITION
05		METALS
05 3000	GTH	METAL DECK
05 4000	GTH	COLD FORMED STRUCTURAL METAL FABRICATIONS
06		WOOD, PLASTICS AND COMPOSITS
06 1000	GTH	ROUGH CARPENTRY
07		THERMAL AND MOISTURE PROTECTION
07 2100	GTH	THERMAL INSULATION
07 5110	APS	BUILT-UP ASPHALT ROOFING OVER INSULATION
07 6000	GTH	FLASHING AND SHEET METAL
07 7100	GTH	ROOF SPECIALTIES AND ACCESSORIES
07 8400	GTH	FIRESTOPPING
07 9200	GTH	JOINT SEALANTS
08		OPENINGS
08 3100	GTH	ACCESS DOORS AND PANELS
08 6200	GTH	SKYLIGHTS
09		FINISHES
09 2423	GTH	PORTLAND CEMENT STUCCO
09 9000	GTH	PAINTING AND COATING
21		FIRE SUPPRESSION
21 1313	BGBW	WET-PIPE SPRINKLER SYSTEMS

22**PLUMBING**

22 0100	BGBW	PLUMBING GENERAL PROVISIONS
22 0510	BGBW	BASIC PLUMBING MATERIALS & METHODS
22 0553	BGBW	PLUMBING IDENTIFICATION
22 0700	BGBW	PLUMBING INSULATION
22 0800	BGBW	PLUMBING_CX_REQUIREMENTS
22 1116	BGBW	DOMESTIC WATER PIPING
22 1119	BGBW	DOMESTIC WATER PIPING SPECIALTIES
22 1316	BGBW	SANITARY WASTE & VENT PIPING
22 1413	BGBW	STORM DRAINAGE PIPING
22 1423	BGBW	STORM DRAINAGE PIPING SPECIALTIES
22 4000	BGBW	PLUMBING FIXTURES

23**HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)**

23 0100	BGBW	MECHANICAL GENERAL PROVISIONS
23 0516	BGBW	PIPE EXPANSION FITTINGS AND LOOPS
23 0519	BGBW	METERS AND GAGES
23 0523	BGBW	VALVES
23 0529	BGBW	HANGERS & SUPPORTS
23 0553	BGBW	MECHANICAL IDENTIFICATION
23 0593	BGBW	TESTING, ADJUSTING, & BALANCING
23 0700	BGBW	HVAC INSULATION
23 0800	BGBW	MECHANICAL_CX_REQUIREMENTS
23 0900	BGBW	INTEGRATED AUTOMATION FACILITY CONTROLS
23 1123	BGBW	NATURAL GAS PIPING
23 2113	BGBW	HYDRONIC PIPING
23 2215	BGBW	HVAC WATER TREATMENT
23 3113	BGBW	METAL DUCTS
23 3300	BGBW	DUCT ACCESSORIES

26**ELECTRICAL**

26 0010	BGBW	ELECTRICAL GENERAL PROVISIONS
26 0519	BGBW	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0526	BGBW	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0533	BGBW	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
26 0548	BGBW	VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
26 0800	BGBW	ELECTRICAL CX REQUIREMENTS
26 2413	BGBW	SWITCHBOARDS
26 2416	BGBW	PANELBOARDS
26 2726	BGBW	WIRING DEVICES
26 2813	BGBW	FUSES
26 2816	BGBW	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
26 4313	BGBW	TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PROJECT MAUNAL TABLE OF CONTENTS

01 0101	Table of Contents
01 1000	Summary
01 2000	Price and Payment Procedures
01 2010	Modification / Change Request (MCR) Worksheet
01 2100	Allowances
01 2300	Alternates [DELETE IF NOT USED]
01 2301	Bid Lots
01 3100	Project Management and Coordination
01 3115	Project Management Communications
01 3300	Submittal Procedures
01 3310	Submittal Transmittal Form
01 3510	APS Project Procedures
01 4000	Quality Requirements
01 5000	Temporary Facilities and Controls
01 6000	Product Requirements
01 6300	Product Substitution Procedures
01 6310	Prior Approval Substitution Request Form
01 6320	Contractor Substitution Request Form
01 7000	Execution Requirements
01 7500	Starting and Adjusting
01 7700	Closeout Procedures
01 7800	Closeout Submittals
01 7878	Energy Conservation Closeout Submittals
01 7900	Demonstration and Training
01 9100	General Commissioning Requirements
01 9310	Post-Warranty Service & 3-Year Maintenance Agreement Post-Warranty Service & 3-Year Maintenance Agreement Form

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.

*******Modify the following paragraph as necessary to describe scope of work of Project.*******

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Work of this Contract covers construction of an approximate SF story and related site work at School in , 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 -1 7800 – Closeout Submittals.

*******Modify the following paragraph as necessary to describe scope of work of Project*******

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. [Fire and security alarm wiring and equipment.]
 4. [Closed circuit television wiring and equipment.]
 5. [Intercom and clock wiring and equipment.]
 6. [Landscaping and irrigation systems.]
 7. [Other items indicated as “By Owner”.]
- B. Items noted “NOT IN CONTRACT” (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 require 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.

*******Modify the following paragraph as necessary to describe scope of work of Project*******

1.5 WORK SEQUENCE

- A. Construct Work in phases to accommodate [Owner's occupancy requirements].
 1. Phase 1 –
 - a. .
 - b. .
 2. Phase 1 –
 - a. .
 - b. .
- B. Refer to Document 00 2000 – Instruction to Bidders and Document 00 4000 – Bid Form for time of completion for each phase.
- C. Coordinate construction schedule with Owner and Design Professional.

1.6 CONTRACTOR USE OF SITE

*******Use the following paragraph if project is new construction and there are no restrictions on using site.*******

A. Contractor will have unrestricted use of site.

*******Use the following paragraph if project is renovation, includes additions to existing buildings, or there are restrictions on using site.*******

B. Existing building and site will be [occupied] [partially occupied] [vacated] during construction. [Cooperate with Owner to minimize conflict and to facilitate Owner's operations during regular and after-hours use.]

C. Contractor will have restricted use of site to allow [Owner occupancy] [Owner to conduct normal operations] [installations by others] [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 during time periods coordinated in advance with Owner.
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 designated school representative(s) on matter of 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 [shall not use] [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:
 - a. [Normal weekday work hours.]
 - b. []

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.
- D. 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 nor lend them out during the progress of work.
 - E. 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.
 - F. Do not allow dust and debris to blow onto adjacent restricted areas.
 - G. Provide 72 hours notice to Owner for any work that may interrupt or otherwise impact the facility's normal operation including noisy dust or odor producing activities.
 - H. 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.
 - I. 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. .
 4. Schedule outages during off hours to facilitate Owner's operations.
 5. Submit written requires for outage to Architect 72 hours before anticipated outage. Outage must be approved in writing by Design Professional.
 - J. 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 of 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 Document 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: Click here to enter text.
2. Project Manage: Click here to enter text.
3. Address:
Click here to enter text.
Click here to enter text.
4. Telephone number: Click here to enter text.
5. Fax number: Click here to enter text.
6. Email address: Click here to enter text.

B. Where the term "Owner" is used in the Contract Documents, it is defined as Albuquerque Public Schools (Albuquerque Municipal School District Number 12, Bernalillo and Sandoval Counties, New Mexico).

1. School District Contact (Staff Architect/Engineer): Click here to enter text.
2. Address: 915 Oak Street, SE, Albuquerque, NM 87106
3. Telephone number: Click here to enter text.
4. Fax number: 505-246-9020
5. Email address: Click here to enter text.

1.8 DEFINITIONS

A. Refer to Document 00 7000 – General Conditions, Article 1.1 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 and Project site. Same meaning as furnish.
 3. Furnish: Supply, deliver, and unload at Project site. Same meaning as supply.
 4. Install: Operations and 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.
IBC –	International Building Code as published by International Code Council.
UL –	Underwriters Laboratory.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

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.

1.2 SCHEDULE OF VALUES

A. Procedures:

1. Submit for review by Design Professional 3 copies of preliminary Schedule of Values within 7 days 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.

B. Format: Typed schedule on standard form or electronic media printout approved by Design Professional. Sum of all values shall equal total Contract Sum.

C. 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 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 – 5000 – Agreement Between Owner and Contractor.
- C. Preparation:
 1. Use Schedule of Values for listing items in Application for Payment.
 2. Complete each entry on Application for Payment form. Incomplete forms will be returned without action.
 3. List each authorized Change Order as a separate line item 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 invoice 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 Application for Payment.

1. Initial Application for Payment: Submit after the following have been submitted and accepted by Design Professional and Owner.
 - a. Certifications 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 Applications 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 7700 – Closeout Procedures.
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. Design Professional will prepare Change Orders to adjust Contract Sum for:
 - a. Differences in costs between products purchased and cash allowances stated in Section 01 2100 – Allowances, if applicable.
 - b. Differences in cost for unit price work based on estimated quantities and cost computed with actual measured quantities, if applicable.
 4. Contractor proposed Change Order: Contractor any 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. Complete 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.
 5. 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. Documentation 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 cost 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 subcontractors.

D. Revision of documents: After authorization of Change Order revise:

- a. Schedule of Values and Application for Payment forms to record each Change Order as a separate line item and adjust Contract Sum and Time.
- b. Progress Schedules to reflect changes in Contract Time and to adjust times for other work items affected by changes. Resubmit revised schedule.
- c. Record changes in Project Record Documents.

1.5 UNIT PRICE PROCEDURES

[***Include this article if certain items of work are to be bid as unit prices. Document 00 300 – Bid Form will need to include a bid item for each unit price item of work and state the estimated quantity. Each specification section which contains unit price work should cross reference to this section for 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 estimated on which bids will be compared and the Contract Sum determined.
 1. If actual work required 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: _____

PROJECT NO. _____

DESCRIPTION OF PROPOSED WORK: Click here to enter text.

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.

[DO NOT USE ALLOWANCES WITHOUT PERMISSION OF APS FDC]

SECTION 01 2100

ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Cash allowances: Descriptions, amounts, and procedures for cash allowances covering the following:
 - a. Pre-selected HAC Equipment
 - b.

1.2 CASH ALLOWANCES

A. Costs included in cash allowances:

1. Cost of product or service to Contractor or subcontractor less applicable trade discounts.
2. Delivery to site or location designated by Architect.

B. Costs not included in cash allowance but included in Contract Sum:

1. Product handling and storage at the site.
2. Contractor's overhead and profit.
3. Installing Subcontractor's overhead and profit.
4. Applicable taxes are applied to the Base Bid and Bid Lots.

C. Depending on the product or service, cost of production, installation, finishing, testing, and demonstration may be included in cash allowance. Refer to individual allowance descriptions.

D. Architect's responsibilities:

1. Consult with Contractor for consideration and selection of allowance products or service.

2. Select products or arrange for service in consultation with Owner and transmit decision to Contractor.
 3. Prepare Change Orders.
- E. Contractor's responsibilities:
1. Assist Architect in selection of allowance products or service.
 2. Obtain proposals from suppliers and offer recommendations.
 3. On notification of selection by Architect and Owner, execute purchase agreement with designated supplier.
 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 5. Promptly inspect allowance products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- F. Differences in cost between allowances and products purchase will be adjusted by Change Order unless indicated otherwise in Contract.

1.3 CASH ALLOWANCE SCHEDULE

[***Each specification section that contains work covered by a cash allowance should have a cross reference to this section. Amount of cash allowance should be stated in this section and not repeated in other sections.*****]**

- A. Division 23-Heating, Ventilating and Air Conditioning: Include the sum of \$[] for Pre-selected HVAC Equipment. Refer to attached Equipment List. The Pre-selected HVAC Equipment is to be provided without substitutions allowed.
- B. Section [] – []: Include a sum calculated from required quantity and stated unit price of \$[] per [LB] [LF] [SF] [SY] [CF] [CY] [EACH] for purchase of [].
- C. Section [] – []: Include sum of \$[] for installation of [].
- D. Section [] – []: Include sum of \$[] for purchase, delivery, and installation of [].
- E. Section [] – []: Include sum of \$[] for purchase, deliver, installation, testing and demonstration of [].

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

[Consult APS FDC before using this Section; only Additive Alternates should be used.]

SECTION 01 2300

ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Procedures and descriptions for alternates which decrease or increase scope of project.
- B. Alternates define a modification to a portion of the Base Bid.

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. Alternates will be selected in order listed on Bid Form and as allowed by available funding.

[***In order to simplify bidding and ensure low competitive prices, avoid or minimize the number of alternates and keep scope of alternates simple and direct. Typically, additive alternates are used. It is also possible to use deductive alternates.*****]**

[***Some alternates can result in either an increase or decrease in the bid amount. An example is bidding an alternative method or substitute material in order to determine the lowest cost for performing a work item. In this instance, alternates would not be described as either additive or deductive.*****]**

1.3 ALTERNATE NO. 1 –

- A. Alternate requires...
- B. Include as part of alternate...
- C. If alternate is accepted...

ALTERNATE NO. 2 –

- A. Alternate requires [construction] [provision] [installation] of by method in lieu of specified in Section – .
- B. Include as part of alternate

C. If alternate is accepted, delete [] as part of Base Bid.

ALTERNATE NO. 3 – []

A. Alternate requires [construction] [provision] [installation] of [] by [] method in lieu of [] specified in Section [] – [].

B. Include as part of alternate []

C. If alternate is accepted, delete [] as part of Base Bid.

1.4 PROCEDURES

A. Consider all work that must be accomplished for complete incorporation of alternates including modifications to Base Bid items.

B. Include in lump sum prices for alternates all costs of labor, materials, equipment, permits, fees, insurance, bonds, overhead, and profit.

C. Immediately after aware of Contract, advise all necessary personnel and suppliers as to which alternates 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 alternatives.

D. Coordinate related work and modify surrounding work of each alternate.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01 2301

BID LOTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: Procedures and descriptions for Bid Lots which decrease or 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 Bid Lots.
- B. Bid Lots are individual bids separate from the Base Bid. Bid Lots may or may not be awarded to the Successful Offeror for the Base Bid, or to other Offerors. Bid Lots may or may not be awarded in the order listed on Bid Form. Bid Lots will only be awarded as allowed by available funding.

1.3 BID LOT NO. 1 – BOILER CONTROLS

- A. The boiler system controls will be converted from Pneumatic controls to DDC controls, added to the building control system and all existing controls and devices associated with the pneumatics removed completely.
- B. New DDC controls shall be provide the temperature control valve, fluid temperature sensors, boiler on/off, pump controls.
- C. New programming shall be provided per the sequence of control on the drawings.

1.4 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 cost of labor, 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

PART 3 – EXECUTION

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. Document 00 2000 – Instructions to Bidders: Pre-Bid Conference.
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 number. 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 progress of Work.
2. Distribute contact information and post in field office coordination.

1.3 GENERAL COORDINATION REQUIREMENTS

- A. Scheduling: Coordination 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 spate specification sections in preparation for final inspections specified in Section -1 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. User of premises by Contractor and Owner, Owner's occupancy requirements, work hours, regular school schedule and special schools schedule considerations.
5. Construction schedule, work schedule, 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 schools 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

- A. 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.

- B. Make arrangements for meetings, prepare agenda, and distribute notice of meetings to participants, Design Professional, and Owner 3 days in advance of meeting.
- C. Preside at meetings. Record minutes and distribute copies within 3 days after meeting to participants, entities affected by meeting decisions, Design Professional, and Owner.
- D. Attendance: Contractor, job superintendent, and subcontractors and suppliers as appropriate to agenda. Owner representative, Design Professional, and consultants may attend as appropriate.
- E. Prepare agenda to cover topics pertinent to continued progress and successful completion of Work. Suggested topics:
 - 1. Review previous meeting minutes.
 - 2. Review schedules and progress, identify impediments, and determine measures to maintain schedules.
 - 3. Review field observations, problems, and decisions.
 - 4. Review status of submittals.
 - 5. Review off-site fabrication and delivery schedules.
 - 6. Quality control.
 - 7. Review proposed MCRs and pending proposals from Contractor including impact on schedule.

1.8 PRE-INSTALLATION CONFERENCES

*******Each section requiring pre-installation conference should list items to be covered at conference and cross reference to this section for meeting procedures. If pre-installation conferences are not required, delete this article.*******

- A. When required by and 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 prepare participants and Design Professionals.

- 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 x 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 extension.
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 month.
3. Projected percentage of completion for total Work as of first day of each month.
4. [Work of separate construction phases.]
5. Required delivery dates for Owner furnished products and required completion dates for work by others. Include separate Activities for Owner's Separate Contractors whose work is integrated into the construction schedule, milestones and obtaining the Certificate of Occupancy, such as hazardous materials abatement, Testing and Balancing, Commissioning, alarm systems, elevator phone system, Surveyor's certification of as-built grading and drainage, and landscaping where applicable.
6. Required dates for return of specific submittal and for selection of finishes [and products furnished under allowances].

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.
 - a. Identify progress of each activity to date of submittal and projected completion date.
 - b. Show activities modified since last submittal and other identifiable changes.
 - c. Provide narrative report as needed to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken or proposed and its effect.

1.10 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Indicate functional and special relationship of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - e. Indicate required installation sequences.
 - f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating

proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate sub framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the Following:
 - a. Sizes and bottom elevations of ductwork, piping and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the Followings:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (31.5 mm) in diameter and larger.
 - b. Light fixtures, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.

- c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire-Protection System: Show the following:
- a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

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 requirement 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 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

[***The following section 01 3115 – Project Management Software is used on APS funded projects. If PSFA funds all or part of this project delete this section and substitute the second section 01 3115 – Project Management Software*****]**

SECTION 01 3115

PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 PROJECT MANAGEMENT SOFTWARE

- A. Albuquerque Public Schools has adopted e-Builder software for project management.

1.2 SUMMARY

- A. Project Management Communications: The Contractor shall use the Internet web based project management communications tool, E-Builder[®] ASP software, and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
 - 1. Project management communications is available through E-Builder[®] as provided by "e-Builder[®]" in the form and manner required by APS, and seat licenses shall be purchased by the Contractor.
 - 2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited.
- B. Training: E-Builder[®] will provide initial training sessions scheduled by APS, the cost of which is included in the initial users fee. Users are required to attend the scheduled training sessions they are assigned to. Requests for specific scheduled classes will be on a first come first served basis for available spaces. Companies may also obtain group training from E-Builder at their own expense, please contact E-Builder[®] for availability and cost.
- C. Support: E-Builder[®] will provide on-going support through on-line help files.
- D. Project Archive: The archive shall be available to each team member at a nominal cost. The archive set will contain only documents that the firm has security access to during construction. All legal rights in any discovery process are retained. Archive material shall be ordered from e-Builder[®].

- E. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD files, processes or design information distributed in this system is intended only for the project specified herein.
- F. Purpose: The intent of using E-Builder® is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files
- G. Authorized Users: Access to the web site will be by individuals who are licensed users.
1. Individuals may use the User Application included in these specifications or may request the User Application.
 2. Submit completed user application forms with check made payable to "e-Builder, Inc."
 3. Authorized users will be contacted directly by the web site provider, E-Builder®, who will assign the temporary user password.
 4. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.
- H. Administrative Users: Administrative users have access and control of user licenses and all posted items. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!** Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).
- I. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using E-Builder® to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
 - a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
 - b. The system shall make it easy to identify revised or superseded documents and their predecessors.

- c. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
2. Document Security:
- a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties communication except for Administrative Users. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!**
3. Document Integration:
- a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
4. Reporting:
- a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
5. Notifications and Distribution:
- a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.
6. Required Document Types:
- a. RFI, Request for Information.
 - b. Submittals, including record numbering by drawing and specification section.
 - c. Transmittals, including record of documents and materials delivered in hard copy.
 - d. Meeting Minutes.
 - e. Application for Payments (final).
 - f. Architect's Supplemental Instructions.
 - g. Modification/Change Requests (MCR's).

- h. Change Orders (final).
 - i. Review Comments.
 - j. Daily Field Reports.
 - k. Construction Photographs.
 - l. Drawings.
 - m. Supplemental Sketches.
 - n. Schedules.
 - o. Specifications.
 - p. Punch Lists.
 - q. Commissioning Reports and Logs.
 - r. Close-Out Documents.
- J. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the E-Builder® web site by licensed users.
- a. The Owner and his representatives, the Construction Manager (if hired for the project) and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.
 - b. The Owner and his representatives, the Construction Manager (if hired for the project) and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.
 - c. The Owner and his representatives, the Construction Manager (if hired for the project) and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
 - d. The following are some but not all of the paper documents which require original signature:
 - 1) Contract
 - 2) Change Orders

3) Application & Certificates for Payment

K. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager (if hired for the project) and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:

1. Providing suitable computer systems for each licensed user at the users normal work location¹ with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
2. Each of the above referenced computer systems shall have the following minimum system² and software requirements:
 - a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)
 - 1) PC system 2.4 MHz Intel Pentium 4 or equivalent AMD processor
 - 2) 2 GB Ram
 - 3) Display capable of SVGA (1024 x 768 pixels) 256 colors display
 - 4) 101 key Keyboard with mouse.
 - b. Operating system and software shall be properly licensed.
 - 1) Internet Explorer 9 or other browser (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.
 - 2) Computer Operating System: Microsoft Windows XP, Vista or 7.
 - 3) Adobe Acrobat Reader (current version is a free distribution for download).
 - 4) Or, users intending to scan and upload to the documents area of E-Builder® should have Adobe Acrobat (current version must be purchased).
 - 5) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

¹ The normal work location is the place where the user is assigned for more than one-half of his time working on this project.

² The minimum system herein will not be sufficient for many tasks and may not be able to process all documents and files stored in the E-Builder® Documents area.

- 6) Scheduling Software: Microsoft Project or Primavera

- c. Scanner: minimum 800 x 600 pixels and a digital camera with minimum resolution of one (1) megapixel.

- d. Connection Speed/Minimum Bandwidth: DSL, ADSL, or T1 Line for transferring a minimum of 3 Mbps Downstream and 512 Kbps Upstream.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

[***The following section 01 3115 – Project Management Software is used on projects partially or wholly funded by NM PSFA. Delete the previous section 01 3115 – Project Management Software if this is the case.*****]**

SECTION 01 3115

PROJECT MANAGEMENT COMMUNICATIONS

PART 4 - GENERAL

4.1 PROJECT MANAGEMENT SOFTWARE

- A. Albuquerque Public Schools and the Public School Facilities Authority (PSFA) have adopted e-Builder software for project management.

4.2 SUMMARY

- A. Project Management Communications: The Contractor shall use the Internet web based project management communications tool, E-Builder[®] ASP software, and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
 - 1. One seat license for E-Builder[®] will be provided by PSFA at no charge to the Contractor. Additional seat licenses can be purchased by the Contractor on an annual fee basis from E-Builder.
 - 2. The project communications database is on-line and fully functional. Electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited.
- B. Training: PSFA will provide initial training.
- C. Support: PSFA will provide on-going technical support.
- D. Project Archive: The archive shall be available to each team member at a nominal cost. The archive set will contain only documents that the firm has security access to during construction. All legal rights in any discovery process are retained. Archive material shall be ordered from e-Builder[®].
- E. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD files, processes or design information distributed in this system is intended only for the project specified herein.

- F. Purpose: The intent of using E-Builder® is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files
- G. Authorized Users: Access to the web site will be by individuals who are licensed users.
1. Individuals may use the User Application included in these specifications or may request the User Application.
 2. Submit completed user application forms with check made payable to "e-Builder, Inc."
 3. Authorized users will be contacted directly by the web site provider, E-Builder®, who will assign the temporary user password.
 4. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.
- H. Administrative Users: Administrative users have access and control of user licenses and all posted items. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!** Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).
- I. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using E-Builder® to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
 - a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
 - b. The system shall make it easy to identify revised or superseded documents and their predecessors.
 - c. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
 2. Document Security:
 - a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual

parties communication except for Administrative Users. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!**

3. Document Integration:
 - a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
4. Reporting:
 - a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
5. Notifications and Distribution:
 - a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.
6. Required Document Types:
 - a. RFI, Request for Information.
 - b. Submittals, including record numbering by drawing and specification section.
 - c. Transmittals, including record of documents and materials delivered in hard copy.
 - d. Meeting Minutes.
 - e. Application for Payments (final).
 - f. Architect's Supplemental Instructions.
 - g. Modification/Change Requests (MCR's).
 - h. Change Orders (final).
 - i. Review Comments.
 - j. Daily Field Reports.
 - k. Construction Photographs.

- l. Drawings.
 - m. Supplemental Sketches.
 - n. Schedules.
 - o. Specifications.
 - p. Punch Lists.
 - q. Commissioning Reports and Logs.
 - r. Close-Out Documents.
- J. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the E-Builder® web site by licensed users.
- a. The Owner and his representatives, the Construction Manager (if hired for the project) and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.
 - b. The Owner and his representatives, the Construction Manager (if hired for the project) and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.
 - c. The Owner and his representatives, the Construction Manager (if hired for the project) and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
 - d. The following are some but not all of the paper documents which require original signature:
 - 1) Contract
 - 2) Change Orders
 - 3) Application & Certificates for Payment
- K. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager (if hired for the project) and his representatives, the Architect and his consultants, and the

Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:

1. Providing suitable computer systems for each licensed user at the users normal work location³ with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
2. Each of the above referenced computer systems shall have the following minimum system⁴ and software requirements:
 - a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)
 - 1) PC system 2.4 MHz Intel Pentium 4 or equivalent AMD processor
 - 2) 2 GB Ram
 - 3) Display capable of SVGA (1024 x 768 pixels) 256 colors display
 - 4) 101 key Keyboard with mouse.
 - b. Operating system and software shall be properly licensed.
 - 1) Internet Explorer 9 or other browser (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.
 - 2) Computer Operating System: Microsoft Windows XP, Vista or 7.
 - 3) Adobe Acrobat Reader (current version is a free distribution for download).
 - 4) Or, users intending to scan and upload to the documents area of E-Builder® should have Adobe Acrobat (current version must be purchased).
 - 5) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.
 - 6) Scheduling Software: Microsoft Project or Primavera

³ The normal work location is the place where the user is assigned for more than one-half of his time working on this project.

⁴ The minimum system herein will not be sufficient for many tasks and may not be able to process all documents and files stored in the E-Builder® Documents area.

- c. Scanner: minimum 800 x 600 pixels and a digital camera with minimum resolution of one (1) megapixel.
- d. Connection Speed/Minimum Bandwidth: DSL, ADSL, or T1 Line for transferring a minimum of 3 Mbps Downstream and 512 Kbps Upstream.

PART 5 - PRODUCTS

Not used.

PART 6 - EXECUTION

Not used.

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 x 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 sections 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 associated specification 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: 8½ x 11 inches minimum and 36 x 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. 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 specifications 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. Manufacturer's printed instruction for activities such as delivery, storage, assembly, installation, wiring, start-up, adjusting, finishing, and maintaining.

2. Indicate pertinent portions and identify conflicts between manufacturer's instruction and Contract Documents.

1.8 DESIGN DATA AND CALCULATIONS

- A. Submission: Submit the number of copies which Contractor requires plus [3] [4] 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 MANUFACTURER'S 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 the 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 8½ x 11 inch white paper.
3. Bind with titled cover in folder, plastic binder, or three ring binder as appropriate for quality of material.

C. Reports shall include:

1. Time, location, condition, and duration of activity.
2. Names of persons performing and witnessing activity.
3. Description of activity, data record, and results.
4. Deficiencies found, corrective measures, and results of retesting.
5. 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: _____

* * * * *

***** Architect may modify specific language below in accordance with
Architect's review stamp. *****

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 3510

APS PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes special procedures for Albuquerque Public Schools projects.

1. APS Personnel.
2. Work by Others.
3. Access to facilities.
4. Security Procedures.
5. Use of Site.
6. Use of site facilities.
7. Schedule and Hours of Operation.
8. Safety and Appropriate Behavior.
9. Testing and Inspections.
10. Utility Locating.
11. Utility Interruptions.
12. Contractor Certifications.

1.2 APS PERSONNEL

- A. Construction Administration: provided by APS Facilities Design & Construction (FDC), 915 Oak Street, SE, Albuquerque, NM 87106; (505) 848-8810; fax (505) 246-9020.
- B. Director, FDC: Authorized signatory for contracts and modification to contracts.
- C. Staff Architect (or Engineer), FDC: Responsible for management of project during design and bidding phases. Also coordinates other FDC personnel.
- D. Construction Manager, FDC: Responsible for management of project during construction and occupancy. Also coordinates other FDC personnel.

- E. Site Administration: person, usually a Principal or Assistant Principal, responsible for a particular APS site.
- F. APS Maintenance and Operations: contact point for utility emergencies, M&O Control Center, 765-592-, extension 212.
- G. APS M&O Environmental Management Department: contact point for asbestos and hazardous materials in existing construction.
- H. APS Police: Respond to security incidents at schools, patrol only on occasion. General Contractor is responsible for security of work area.
- I. APS Risk Management: contact point for reporting of accidents and injuries on project.
- J. APS Public Information Office: contact point for media; refer all request by media to this office, or to the Director, FDC.
- K. All official communications from the General Contractor and its subcontractors will route through the General Contractor's Project Manager and/or Superintendent to the Design Professional. The Design Professional then communicates to the APS Construction Manager and/or Staff Architect (or Engineer), unless directed otherwise.
- L. The APS Construction Manager and/or Staff Architect (or Engineer) in turn will communicate with APS entities, vendors, designers and contractors. In emergency situations the General Contractor will directly contact the appropriate APS entity directly, and communicate actions taken to the Construction Manager and/or Staff Architect (or Engineer).

1.3 WORK BY OTHERS

- A. APS will contract for the following work by others for this project: [Edit list].
- B. Asbestos Abatement, if any: contact APS M&O Environmental Management Department.
- C. Collection of PCB-containing ballasts, if any: contact APS M&O Environmental Management Department.
- D. Portable Building Movers and Installers.
- E. Fire Alarm System (infrastructure for system by General Contractor).
- F. Voice Communications System (infrastructure for system by General Contractor).
- G. Data Communications System (infrastructure for system by General Contractor).
- H. Security Alarm System (infrastructure for system by General Contractor).

- I. Testing and Balancing.
- J. Landscaping and Irrigation (irrigation sleeves by General Contractor).
- K. Playground Equipment (playground equipment areas, if any, by General Contractor).
- L. Owner-furnished equipment as identified in the construction documents (utility hook-ups by General Contractor unless noted otherwise).
- M. Furniture: by APS (utility connections to systems furniture, if any, by General Contractor).

1.4 ACCESS TO FACILITIES

- A. Except for new school construction (site not occupied by APS), contractor shall obtain keys to gates and buildings from the M&O Lockshop, 915 Oak Street, SE.

1.5 SECURITY PROCEDURES

- A. Except for new school construction (site not occupied by APS), contractor's access to site is limited to normal weekday work hours. For new construction comply with local codes, ordinances and property covenants.
- B. For after-hours and weekend access, contractor must fill out and submit, through the Site Administrator, a security release form to APS Police, to authorize after-hours access. General Contractor's Superintendent or designee calls APS Police immediately before an after-hours access to a site, and again immediately upon departing a site, to clear and reset the site's security alarms.
- C. Contractor Identification
 - 1. Badges: FDC will provide numbered badges for contractor's use within occupied facilities. Identifiable company work gear, safety vests or company vests may be sufficient identification for workers within secured work areas.
 - 2. Contractor's project superintendent shall sign in and out daily with school administration, projects at existing facilities.

1.6 USE OF SITE

- A. Except for new school construction (site not occupied by APS), various portions of the project site will be use by Owner and the public during the time that the work is performed.
- B. Schedule and coordinate the work to minimize disruption to school and site operations.

- C. Limit use of project site area essential to performance of the work; confine construction operations to areas designated in construction documents.
- D. Keep existing entrances and driveways serving the project site clear and available for use by Owner, public, students and staff, and emergency vehicles.
- E. Store materials and equipment only in designated areas; Contractor assumes full responsibility for the protection and safekeeping of such materials and equipment.
- F. Keep interior areas free from accumulation of waste materials, trash or construction debris.

1.7 USE OF SITE FACILITIES

- A. Where available, contractor may use a site's power and water for construction operations.
- B. Contractor may not use sanitary facilities or drinking water at a school.

1.8 SCHEDULE AND HOURS OF OPERATION

- A. It is anticipated that the Contractor will work normal weekday work hours. Early or late hours may be subject to neighborhood restrictions and noise control ordinances.
- B. APS reserves the right to re-schedule Contractor's operating during testing and examination periods; testing periods vary among schools and will be discussed at the pre-construction conference.
- C. APS reserves the right to re-schedule Contractor's heavy equipment operations during times when children are allowed to be outdoors, if such operations are in close proximity to play areas.
- D. APS reserves the right to re-schedule and control Contractor's movement of vehicles in and out of a construction site during morning drop-off and afternoon dismiss periods, if the site has traffic congestion.

1.9 SAFETY AND APPROPRIATE BEHAVIOR

- A. Post signs limiting access to construction area on perimeter fence.
- B. Wear badges as determined at pre-construction conference.
- C. Implement safety and visitor check-in procedures as appropriate.
- D. Maintain emergency vehicle access, and fire drill routes, at site.

- E. Smoking, alcohol, and illegal drug use are prohibited on APS property. APS has a “no tolerance” policy which will require immediate removal of persons not complying with this requirement.
- F. No direct communication with children permitted. No foul language, sexist or racist comments allowed on APS property. APS has a “no tolerance” policy and will require immediate removal of persons not complying with this requirement.
- G. Report unscheduled tours and visitors to APS FDC.

1.10 TESTING AND INSPECTIONS

- A. Special Inspections required by code are provided by APS.
- B. Other testing and inspection [will] [will not] be provided by APS.
- C. Testing and balancing of HVAC systems is provided by APS.

1.11 UTILITY LOCATING

- A. APS is a member of New Mexico One-Call. Contact New Mexico One-Call for utility locations.

1.12 UTILITY INTERRUPTIONS

- A. Provide a minimum of 72 hours advance notice of planned utility interruptions to allow APS to schedule equipment shut-downs and re-starts associated with the interruptions, and to allow schools to reschedule programs due to shut-downs if necessary. Avoid shut-downs on school days.
- B. Protect facilities, grounds and equipment from damage due to shut-down and start-up of utilities. Repair of damage to APS property due to utility shut-downs is General Contractor’s responsibility.

1.13 CONTRACTOR CERTIFICATIONS

- A. Contractor shall sign and forward to the Architect/Engineer of record, who will in turn complete and return, the attached Certificate of Asbestos Free Construction (EPA AHERA 40 CFR 763.99 Paragraph (7) c).

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

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

[***Since this paragraph states that current edition of reference standards will apply, it is not necessary to indicate dates for standards in the remainder of the project manual.*****]**

- 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 the 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 mock-up is not part of construction. Sections requiring mock-ups should cross reference to this section. If mock-ups are not required, delete this article.*****]**

- A. When required by an individual specification section, construct mock-up of construction component or assembly [for review by Architect,] [testing,] [and demonstration].
- 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 field sample is part of construction. Sections requiring field samples should cross reference to this section. If field samples are not required, delete this article.*****]**

- 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 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-compliance to specified requirements shall be performed by same testing firm and paid for by Contractor.

1.7 MANUFACTURER'S FIELD SERVICES AND REPORTS

[***Sections requiring a representative of manufacturer to observe installation should cross reference to this section. If manufacturer's field services are not required, delete this article.*****]**

- 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 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.

B. Related documents and sections.

1.2 REFERENCES

- A. NFPA 10 – Standard for Portable Fire Extinguishers.
- B. NFPA 241 – 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

[***Include the following paragraph is Contractor is to provide and pay for temporary electricity.*****]**

- A. Provide and pay for temporary electricity used during construction. Provide service disconnect and overcurrent protection. Provide temporary feeder as required.

[***Include and edit the following paragraph if there is existing power at site and Owner is to pay for temporary electricity.*****]**

- B. Connect to existing power source at site. [Do not disrupt Owner's need for continuous service.] Provide service disconnect and overcurrent protection. Provide temporary feeder as required. [Owner will pay cost of electricity used. Exercise measures to conserve power.] [Provide separate metering and reimburse Owner for cost of energy used.]
- C. Provide power outlets for construction operations with branch wiring, distribution boxes, and flexible power cords as required.
- D. 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 may be 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 gasses.
- 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.

[***Include the following paragraphs if project is renovation of existing building and Contractor is allowed to use existing HVAC system.*****]**

- 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 as to prevent damage to existing building systems.

1.7 TEMPORARY WATER SERVICE

[***Include the following paragraph if Contractor is to provide and pay for temporary water service.*****]**

- A. Provide, maintain, and pay for suitable quality water service required for construction operations.

[***Include the following paragraph if there is existing water source on site. Edit to reflect payment by Owner or Contractor.*****]**

- B. Connect to existing water source for construction operations. [Owner will pay cost of water used. Exercise measures to conserve water.] [Provide separate metering and reimburse Owner for cost of water used.]
- C. Assume responsibility for temporary connections and water lines. 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

[***Edit this article to reflect scope of project, if there are existing buildings and landscaping, and type of barriers and protections specifically required.*****]**

- 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 exist 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] ass necessary to maintain them viable in the event that existing irrigation system is made temporarily inoperable due to the

Work. Replace dead plan 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. 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 NFPA 241.
- B. Fire extinguishers: Provide hand carried, portable, UL rated fire extinguishers of type and size recommended by NFPA 10 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.
- D. Heating devices: Exercise care and monitor use of temporary heaters to minimize fire risk.
- E. Store combustible materials in fire-safe containers.
- F. 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 spontaneous combustion.
- G. Cutting and welding: Approve in advance use of open flame cutting, welding, and soldering equipment. Ensure that safe conditions exist before granting approval.

[***Include the following paragraph when Project involves construction activities which may cause soils disturbance and erosion on site; required for projects in which one acre or more of area will be disturbed.*****]**

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 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. Contractor shall determine whether Project required an EPA NPDES storm water discharge permit in conformance with all regulations governing the disturbance of construction site areas.
 2. If storm water discharge permit is required, then 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 construction storm water permitting plan requirements.
 - b. Prepare and submit all EPA 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 as required and to Architect as part of Project Closeout documentation package. See Section 01 7800 of Specifications.
 3. If a storm water discharge permit is not required, then the Contractor shall submit to the Architect and Owner prior to the mobilization a signed statement containing specific written justification why such a permit is not required on the Project.
 4. The Contractor shall manage the discharge of storm water from the site in accordance with NPDES permit and the provisions of 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 jobsite at all times. Contractor shall be liable for all fines and construction delays resulting from any governmental agency enforcement action due to a failure by the Contractor to satisfy the above requirements.
 5. Contractor is responsible for payment of all applicable fees and permits related to SWPPP 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

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 deliver personnel and others may contact Contractor. School office shall not be use as destination for Contractor's deliveries.
- C. Prevent unauthorized personnel from accessing school building or site through Contractor's work area.

1.15 FIELD ACTIVITIES

- 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 work force.
- 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 workforce. Fountains shall not be routinely available for Contractor's use.

1.18 PROJECT SIGNS

- A. School District Construction Sign.
 - 1. Furnish project sign and erect on site at location designated by Architect.
 - 2. Construction: Refer to drawing attached to this Section.
 - 3. Sign shall be prepared by professional sign painter using either painted exhibit lettering or die cut adhesive applied letters.

4. Design, style and sizes of lettering, color, and texts shall be 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.

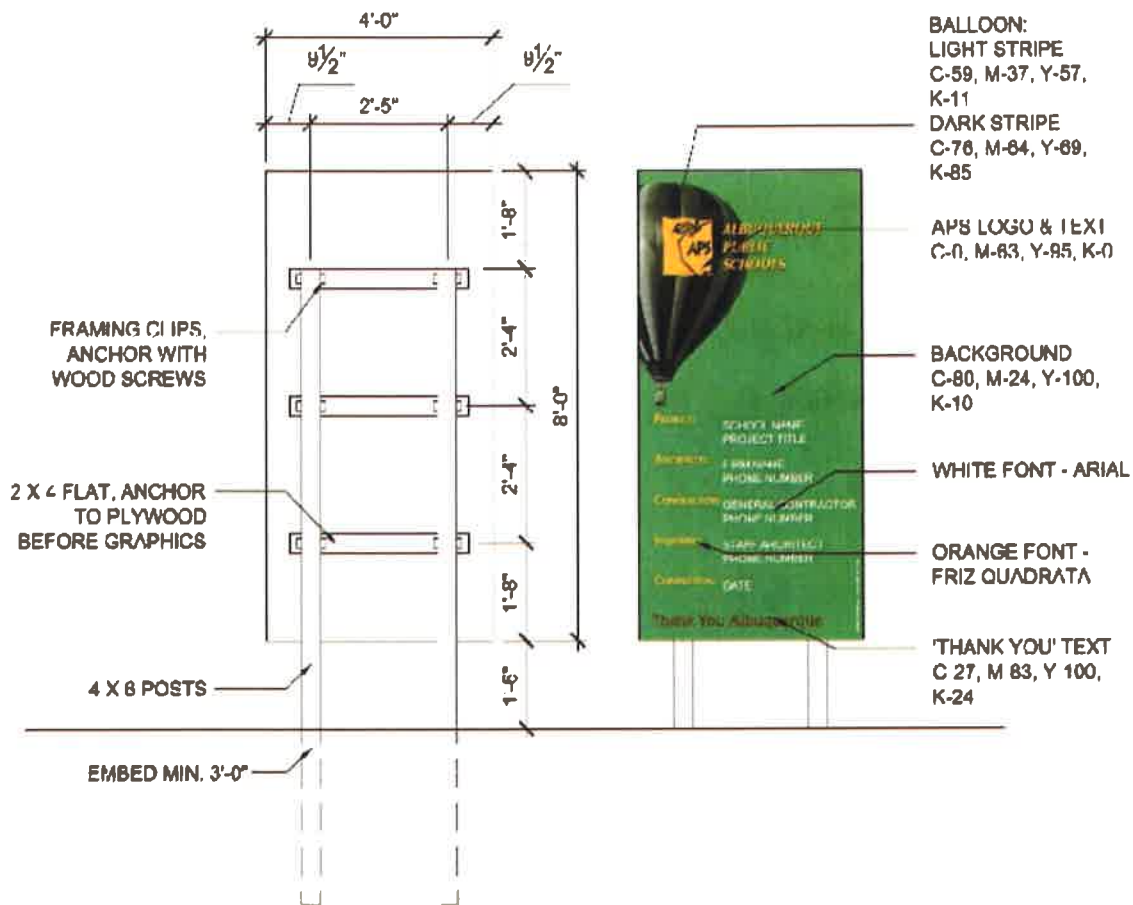
PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

**END OF SECTION
[(PROJECT SIGN DRAWINGS FOLLOW)]**



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 specific 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 request 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 – Instruction to Bidders.
 - 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 product 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. Substitution will not be considered after contract award if indicated or implied on shop drawings and project 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 Document.
 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 – FORMS FOLLOW

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.
9. 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 |
| 7. All changes to Contract Sum related to use of proposed substitution are included in price listed below. Contractor waives claims 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. Progressive 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 alternative 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

[***Edit and modify this part to reflect actual scope, materials, and products of project. Delete items that are not applicable for project.*****]**

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 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 product 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 and the end of the work.
- C. Beginning of removals, cutting, patching, and new Work implies acceptance of existing conditions.

3.2 PREPERATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal crack and opening 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 instruction 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 material 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 and 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 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 opening 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 hole even and smooth.
 3. Drill penetrations through concrete for conduit and piping.
 4. Drill round holes and saw cut rectangular opening 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 meeting requirements of Contract Documents.
 2. Fit work tight to pipes, sleeves, ducts, conduits, and other elements penetrating surfaces.
 3. At penetrations of fire rated wall, 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 telecommunication, data, security, HVAC controls and fire alarms 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 the 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 penetrations and return roof to weathertight condition after 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 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 ¾ 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 7500

STARTING AND ADJUSTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes: General procedures for starting, monitoring, and adjusting of items of equipment and complete systems.

[***This section should be coordinated with sections in Mechanical and Electrical Division specifying startup requirements for mechanical and electrical 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 startup of each system.

3.2 PREPERATION

- A. Prior to startup, inspect items of equipment and system 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 and 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 startup 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. Summary 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

[***At Substantial Completion all or part of Work is sufficiently complete so that Owner can occupy and use all or a portion of Work. For large projects Work may be completed in phases each with a different date of Substantial Completion. Modify this article as required for specific project.*****]**

A. Prior 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 – General Conditions of the Contract 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. Indicated 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. Full functioning of the HVAC Controls Systems, (including logging and trending of utility data from submeters for electricity, natural gas & heating water, and including APS having remote access and control of a web-based system), shall be a requirement of Substantial Completion of the entire construction project.
- D. After inspection by Design Professional and issuance of Certificate of Substantial Completion, Owner will occupy [all] [designated portions] 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 01 2000 – 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 the major HVAC equipment and where each major piece of equipment is located, in order to assist APS M&O in a future comprehensive equipment inventory. Major equipment includes items such as air handlers, chillers, cooling towers, VAC or CV terminal units, and location of computer access to HVAC DCC 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 the 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.
9.

1.2 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to work:

1. Contract Documents.
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.
- E. Contract Drawings and shop 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 dimensions and detail.
 6. Details not on original Contract Drawings.
- F. Documents will be reviewed by Architect at each submittal of Application for Payment to ensure that entries are current.
- G. 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

[***Each specification section requiring operation and maintenance data in manuals should cross reference to this section for general purposes.*****]**

- A. Provide operation and maintenance data for:
1. [Landscaping specified in Sections xx-xxxx – Irrigation System and xx-xxxx – Planting.]
 2. [Automatic gate operators specified in Section xx-xxxx – Chain Link Fences and Gates.]

3. [Motorized doors specified in [Section xx-xxxx – Coiling Doors and grilles] [Section xx-xxxx – Coiling Counter Doors] [Section xx-xxxx – Overhead Sectional Doors] [Section xx-xxxx – Automatic door Operator.]]
4. [Operable partitions specified in Section xx-xxxx – Operable Partitions.]
5. [Food service equipment specified in Section xx-xxxx – Food Service Equipment.]
6. [Folding basketball backstops and gymnasium dividers specified in Section xx-xxxx – Athletic Equipment.]
7. [Fume hood specified in Section xx-xxxx – Laboratory Equipment.]
8. [Motorized bleachers specified in Section xx-xxxx – Telescoping Bleachers.]
9. [Elevator specified in Section xx-xxxx – Hydraulic Elevator.]
10. Mechanical equipment, systems, and controls specified in Division 15 – Mechanical.
11. Electrical equipment, systems, and controls specified in Division 16 – Electrical.
12. Other equipment and systems for which operation and maintenance data is requested in individual specification sections.
- 13.
- 14.

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 2 hard copies and one electronic (PDF) copy 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 list.

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 of 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 8½ 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

[***Each specification section requiring special or extended warranties should cross reference to this section for submittal procedures. When AIA A210 – General Conditions is used, it is unnecessary to specify one-year warranties since there is a one year correction period.*****]**

- A. Provide duplicate notarized copies of special and extended warranties as required by individual specification 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 hard durable plastic cover. Internally subdivide 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 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, Adjusting, and Demonstrating
- D. Prior to or in 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

[***Each specification section requiring extra materials should cross reference to this section for submittal procedures. Limit use of extra materials, consult APS FDC.*****]**

- A. Provide spare parts and maintenance materials in quantities specified in individual sections.
- B. Extra materials shall be produced by the same manufacturer of 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.
 - c.
 2. All security codes and software, 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.
 - 2. NM Gas Company Energy Efficient Buildings Program
 - 3. Modification/Change Request and Change Order

1.2 PNM BUSINESS ENERGY EFFICIENCY PROGRAM

- A. A Pre-Notification Application will be submitted by APS Facilities Design + Construction 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 APS 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 Worksheet (the "Application") as appropriate for the project.
 - 1. Download and complete the "New Construction Prescription Application"; do not download the "Whole Building Application".
 - 2. Submit a completed DRAFT of the Application to Design Professional and APS Facilities Design and Construction 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:
 - 1. Check "Final" Application.
 - 2. Name as is appears on the Utility Bill: *obtain from APS Facilities Design + Construction.*
 - 3. PNM Account Number: *obtain from APS Facilities Design + Construction.*

4. Select Building Type (usually “School/K-12”).
5. Name of Company: Albuquerque Public Schools
6. Name of Contact Person: *insert name of Staff Architect/Engineer*; Title: Staff Architect/Engineer.
7. Phone #: *insert phone number of Staff Architect/Engineer*; Fax #: (505) 246-9020; Email: *insert email address of Staff Architect/Engineer*.
8. Installation Address, City, State, Zip: *insert project address*.
9. Mailing Address: APS Facilities Design + Construction, 915 Oak Street, SE, Albuquerque, NM 87106.
10. Taxpayer ID: *obtain from APS Facilities Design + Construction*. Tax Status: *leave this space blank*.
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 APS Facilities Design + Construction*.
15. Project Completion Date: insert Date of Substantial Completion.

E. Agreement Form:

1. Customer Signature: to be completed by APS Facilities Design + Construction Staff Architect.
2. Third Party Signature: complete this signature before submitting to APS Staff Architect for signature.
3. When complete Application has been reviewed and executed by APS Staff Architect, submit to PNM via electronic and/or hardcopy 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 in the Application Form.
- G. Documents will be reviewed by the Design Professional and APS Facilities Design + Construction 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 indicated payment by the Customer (APS).
 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.

1.3 NM GAS COMPANY ENERGY EFFICIENCY PROGRAM

- A. The project's equipment list will be submitted by APS Facilities Design + Construction during the Design Development phase of the project, to register the project and reserve potential rebate funds.
- B. The General Contractor will be a Third Party signatory on the NM Gas Company Program. As such, GC must provide a W-9 tax form to the utility company. The final rebate provided by NM Gas Company and received by the GC shall be reimbursed in full to APS by means of MCR to the construction contract.

- C. The General Contractor shall participate with CLEAResult, NM Gas Company's Energy Efficiency Program Administrator, to provide all necessary site and equipment information for the project.
 - 1. Arrange a Pre-Inspection walk-thru to document and verify any existing equipment to be removed, replaced, or retro-fitted as a result of the project. (Does not apply to new construction.)
 - 2. Prepare and submit the As-Built equipment list, along with product submittals, for all gas-consuming equipment and energy recovery units on the project.
 - 3. Notify CLEAResult upon project completion.
 - 4. Arrange a Post-Inspection walk-thru to document and verify project installation and quantify final rebate.

1.4 MODIFICATION/CHANGE REQUEST AND CHANGE ORDER:

- A. Prepare an MCR refunding the full amount of PNM and Gas Company rebates to Albuquerque Public Schools via the construction contract balance remaining.
- B. Provide a copy of the final rebate check(s) (sent to the General Contractor as Third Party signatory), as an attachment to the MCR.
- C. The MCR must be submitted to APS within thirty (30) days of receipt of each rebate check.
- D. Five percent (5%) of the Schedule of Values Closeout Line Item (see General Conditions) will be allocated to the Energy Conservation Closeout 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

[***This section should be edited to reflect, size, type of project, and complexity of systems being installed. It needs to be verified that Owner has facility management staff that will attend and benefit from demonstration and training. Training should be focused on experience, job designation, and knowledge of staff. Do not over specify.*****]**

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 session for approval by Architect and Owner.
 - 3. Copies of training manuals and other materials to be used in training sessions for approval by Architect and Owner.
 - 4. Provide Owner additional copy of audio visual 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 within 1 week after completion of training that sessions have been satisfactorily completed. Give times, dates, list of persons trained, 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 representative shall conduct training.

PART 2 - PRODUCTS

2.1 TRAINING MATERIALS

- A. Training manuals: Loose leaf notebook 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 be useful reference for staff maintaining facility.
- B. Visual aids: Provide charts, handouts, overhead projector slides, electronic presentation, 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, startup 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

[***Each specification section requiring demonstrating for Owner's representatives should cross reference to this section for general procedures.*****]**

- A. Provide demonstration and training session to emphasize operation, use, and maintenance of installed items and systems:
 - 1. [Automatic gate operators specified in Section xx xxxx – Chain Link Fences and Gates.]
 - 2. [Motorized doors specified in [Section xx xxxx – Coiling Doors and grilles] [Section xx xxxx – Coiling Counter Doors] [Section xx xxxx – Overhead Sectional Doors] [Section xx xxxx – Automatic Door Operator].]

3. [Operable partitions specified in Section xx xxxx – Operable Partitions.]
 4. [Motorized projection screens and projector mounts specified in Section xx xxxx – Audio-Visual Equipment.]
 5. [Food service equipment specified in Section xx xxxx – Food Service Equipment.]
 6. [Folding basketball backstops and gymnasium dividers specified in Section xx xxxx – Athletic Equipment.]
 7. [Fume hood specified in Section xx xxxx – Laboratory Equipment.]
 8. [Motorized bleachers specified in Section xx xxxx – Telescoping Bleachers.]
 9. [Elevator specified in Section xx xxxx – Hydraulic Elevator.]
 10. Mechanical systems specified in Mechanical Divisions.
 11. Electrical systems specified in Electrical Divisions.
 12. Other items and systems as designated by Architect or requested by Owner.
 - 13.
 - 14.
- B. Conduct at project using actual installed equipment and systems.
- C. Owner shall be responsible for designating and notifying personnel to attend and ensuring attendance at schedule 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 record in accordance with 1.2 Submittals, Paragraph A, Item 7, above.
1. Trainers shall include manufacturer’s representatives and systems installers of the components installed.
 2. Classroom training shall cover all systems and components in accordance with Paragraph 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 9100

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Commissioning is a systematic process of ensuring that building systems and equipment function in accordance with design intent and the owner's operational needs. This will be achieved in the construction, acceptance and warranty phases with actual verification of performance and compliance. The commissioning process encompasses and coordinates the traditionally separate functions of equipment Startup, control systems calibration and adjustments, testing and balancing, performance testing, system documentation and training.
- B. The commissioning process does not take away from or reduce the responsibility of installing contractors to provide a finished and fully functioning product.
- C. 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 operational checkout by installing contractors.
 - 3. Verify and document proper operation and performance of equipment and systems.
 - 4. Verify that O&M documentation provided by the Contractor is complete.
 - 5. Verify that the Owner's operating personnel are adequately trained by the Contractor, Subs or other designated parties.
- D. The following are common abbreviations used in these specifications and the Commissioning Plan. Definitions are found in Article 1.4.

A/E	Architect and Design Engineers	FPT	Functional Performance Test
CC	Controls Contractor	GC	General Contractor (Prime)
CM	APS Construction Manager	MC	Mechanical Contractor
Cx	Commissioning	OR	Owner's Representative
CxA	Commissioning Authority	PFC	Prefunctional Checklist
Cx Plan	Commissioning Plan Document	Subs	Subcontractors to General
EC	Electrical Contractor	TAB	Test and Balance Contractor

1.2 RELATED DOCUMENTS

- A. Drawings and General Conditions of the Contract and other Division 01 Specification Sections apply to this Section.
- B. Related Sections:
 - 1. Division 01 Section 01 3300 “Submittal Procedures” for submittal requirements.
 - 2. Division 01 Section 01 7700 “Closeout Procedures” or 01 7800 “Closeout Submittals” for requirements of project record drawings, Operations and Maintenance manuals, warranties, certifications of inspection, extra materials and other closeout submittals.
 - 3. Division 23 Section 23 0593 “Testing, Adjusting and Balancing” for TAB requirements.
 - 4. Division 23 Section 23 0800 “Commissioning of HVAC Systems” for HVAC commissioning requirements.
 - 5. Division 22 Section 22 0800 “Commissioning of Plumbing Systems” for plumbing commissioning requirements.
 - 6. Division 26 Section 0800 “Commissioning of Electrical Systems” for electrical and lighting control commissioning requirements.

1.3 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- B. While building commissioning is a pre-requisite of LEED certification, it is APS’s policy to commission any project for which major mechanical equipment is included, regardless of LEED certification intent. For LEED-specific requirements, see separate applicable specification sections(s).

1.4 DEFINITIONS

- A. Acceptance Phase: Phase of construction after Startup and initial checkout when functional performance tests, O&M documentation review and training occurs.
- B. 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.
- C. “As-Builts” (also referred to as Record Documents): Shop drawings, commissioning documentation (including PFCs and FPTs), factory start-up data, graphics, operation manuals, training documentation, and field reports which become part of the

documents provided to Commissioning Authority and turned over to the Owner, which are maintained by the General Contractor and Subcontractors.

- D. Architect / Engineer (A/E): The prime consultant (architect) and sub-consultants who comprise the design team, including the HVAC mechanical designer/engineer and the electrical designer/engineer.
- E. Basis of Design (BOD): A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual criteria that support the design process. For APS projects, the Design Development Submittal approved by the Board of Education may serve as the BOD.
- F. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, tasks and documentation requirements of the commissioning process.
- G. Contractor: The General Contractor or authorized representative.
- H. Commissioning Authority (CxA): The CxA is an independent third party entity that directs and coordinates the commissioning process.
- I. Datalogging: Monitoring and storing data such as flow, power, temperature, pressure, lighting levels, etc. for equipment, systems, and/or environments using stand-alone equipment (dataloggers) separate from the building control system.
- J. Daylighting: The placement of windows, or other transparent media, and reflective surfaces so that, during the day, natural light provides effective illumination to the building interior.
- K. Daylighting Controls: Devices, sensors and control systems that regulate the level of illumination within a building as provided by electric lights in response to the presence and level of daylight.
- L. Deficiency: A condition in the installation or function of a component, piece of equipment or system that does not perform properly according to specifications, manufacturer's performance data, sequence of operations, or other operational capabilities. This includes but is not limited to damage or flaws, impaired or limited functionality, manufacturer's defects, installation defects, or non-compliance with the design intent.
- M. Functional Performance Test (FPT): Test of the dynamic function and operation of equipment and systems using direct observation or monitoring methods. In cooperation with others, the CxA develops the Functional Performance Tests in a sequential written form, coordinates, oversees, and documents the actual testing, which is performed by qualified subcontractors as designated by the Contractor.

FPT's are performed after Prefunctional Checklists and Startup are complete and TAB activities are finished.

- N. HVAC Systems (also Mechanical Systems): Heating, ventilation, and air conditioning systems, subsystems and assemblies. This includes all components, devices, controls, sensors, hardware, and other items related to the function and operation of such systems.
- O. Non-Compliance / Non-Conformance: see Deficiency.
- P. Owner's Project Requirements (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. For APS projects, the Design Development Submittal approved by the Board of education may serve as the OPR.
- Q. Prefunctional Checklist (PFC): List of inspection tasks and elementary component test procedures for verifying proper installation and operation of equipment. PFCs are collaboratively developed, approved by the CxA and completed by the installing and/or TAB contractor or vendor. Prefunctional Checks include static inspections and procedures that prepare the equipment and systems for initial operation (e.g. belt tension, oil levels, labeling, gauges, calibrated sensors, etc.). Some Prefunctional Checklist items entail testing the function of a component, piece of equipment or system (e.g. checking rotation and/or measuring voltage imbalance on a motor).
- R. Sampling (also "Statistical Testing"): Functionally testing a fraction of the total number of identical or near identical pieces of equipment, systems, or components.
- S. Startup: The initial starting or activating of dynamic equipment and systems in accordance with industry recognized procedures, standards, Best Practices, and manufacturer's recommendations. This may include execution of Prefunctional Checks.
- T. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" or "as-constructed" systems, subsystems, equipment, and components.
- U. Vendor: System, equipment, and/or device supplier. This also includes service and software providers.
- V. 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 (e.g. HVAC Controls include a 2-year warranty).

1.5 COMMISSIONING TEAM

- A. Individuals, each having the authority to act on behalf of the respective entities the represent, organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, the following:
- B. Members appointed by the Contractor:
 - 1. Project Superintendent.
 - 2. Subcontractors.
 - 3. Installers.
 - 4. Suppliers.
 - 5. Specialists deemed appropriate by the CxA.
- C. Members appointed by the Owner:
 - 1. Commissioning Authority (CxA): Owner will engage the CxA under a separate contract.
 - 2. Representative(s) of the facility user (if feasible).
 - 3. Maintenance and Operations personnel.
 - 4. Architect and engineering design professionals.

1.6 OWNER'S RESPONSIBILITIES

- A. Provide OPR documentation to CxA and Contractor for information and use.
- B. Assign Maintenance and Operations personnel to the project and schedule them to participate in commissioning team activities and trainings as requested.
- C. Provide BOD documentation (prepared by A/E and approved by Owner) to the CxA and Contractor for use in developing Cx Plan, Systems Manual (LEED Enhanced Cx only), and M&O training plan.

1.7 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall assign representatives and/or subcontractors with expertise and authority to act on its behalf, and shall schedule them to perform and fulfill commissioning process activities including, but not limited to , the following:
 - 1. Attend commissioning team and other related meetings held on a variable basis (weekly once equipment reaches start-up phase).
 - 2. Provide to CxA complete copies of all submittals related to commissioned systems.

3. Review and accept commissioning process requirements and test procedures provided by the CxA.
 4. Integrate and coordinate commissioning process activities within construction schedule.
 5. Review and accept content and format PFCs, FPTs, test forms, reports and other documents provided by the CxA.
 6. Complete PFCs, test forms, reports and other documentation as work is completed, and provide to the CxA on a prompt and regular basis.
 7. Provide successful completion of commissioning responsibilities, tests, procedures, documentation and related tasks in accordance with Cx Plan and Contract Documents, as required of Contractor, Subs, and Vendors.
 8. Evaluate and installation or performance deficiencies, identified in the commissioning process and, in collaboration with entity responsible for system and equipment installation, recommend corrective action. Upon approval, provide means and corrective measures for deficiencies.
 9. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
 10. Furnish to the CxA copies of all required construction phase documentation including, but not limited to, addenda, change orders, approved submittals, shop drawings, and as-builts related to commissioned systems.
 11. Provide and coordinate the training of Owner's personnel.
 12. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions and provide to CxA.
- B. Only individuals that have direct knowledge and have witnessed that a line item task has actually been performed shall initial and/or check off tasks on respective commissioning related forms, checklists, test protocols and other associated documentation. It is not acceptable for uninvolved supervisors, individuals or parties to fill out and check off items.

1.8 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Provide commissioning plan.
- C. Convene commissioning team meetings.

- D. Provide project-specific construction checklists and commissioning process test procedures.
- E. Verify the execution of commissioning process activities by project team members using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment to verify compliance with OPR. When random sample does not meet the requirement, the CxA will report the failure in the Issue Log.
- F. Verify successful completion of checklists and tests.
- G. Prepare and maintain the Issues Log.
- H. Prepare and maintain completed construction checklist log.
- I. Witness systems, assemblies, equipment, component Startup, Prefunctional Checks.
- J. Compile test data, inspection reports, and certificates; include them in the Systems Manual and Commissioning Report.
- K. Witness Functional Performance Tests of commissioned systems, equipment and components (statistical sampling in some cases). Test results shall be documented. Approval of the Functional Performance Test results shall be made after review by CxA and Owner's Rep (OR) as needed.
- L. Verify and document that the requirements for training of M&O personnel and building occupants have been completed.
- M. On projects where APS's Extended Maintenance Agreement with the MC is contracted, CxA shall participate in annual site walks to review and document system performance (at 11-month warranty and for two (2) subsequent years).

PART 2 - COMMISSIONED SYSTEMS (AS APPLICABLE)

2.1

- A. Chilled Water System: Chillers and Chilled Water Systems including:
 - 1. Chillers.
 - 2. Pumps.
 - 3. Towers.
 - 4. Heat exchangers.
 - 5. VFDs.

6. Miscellaneous piping components.
 7. Compressors.
- B. Heating Water System: Boilers and Hot Water Systems including:
1. Boilers.
 2. Pumps.
 3. Heat exchangers.
 4. VFDs.
 5. Miscellaneous piping components.
- C. Ventilation Systems:
1. HVAC Air Handling Systems
 2. Terminal Units:
 - a. Fancoils, heat pumps, VAVs, etc.
 - b. Miscellaneous unit heaters, radiation and heating coils.
- D. Computer room air conditioning units (CRAC)
- E. Mini-split systems.
- F. Exhaust and Supply Systems:
1. General & Toilet.
 2. Refrigerant purge.
- G. Facility Management System (Building Automation System)
1. Includes connection/communication with APS FMS server(s).
- H. Plumbing Systems:
1. Domestic Hot Water.
 2. Circulation pumps.
- I. Electrical Systems:
1. Normal Power as it relates to the mechanical systems.

2. Lighting Control Systems.
 3. Emergency Power.
- J. Renewable energy systems:
1. Photovoltaic.
 2. Solar hot water.

PART 3 - EXECUTION

3.1 MEETINGS

- A. Scoping Meeting (Cx 'Kickoff'): The CxA will schedule, plan and conduct a commissioning scoping meeting early in the Construction phase with the commissioning team in attendance, including Contractor, Owner's Rep. (OR) and involved Subs.
- B. Routine Meetings: Meetings will be planned and conducted by the CxA as construction progresses. These meetings will involve Contractor and/or Subs and cover coordination, deficiency resolution, planning and other issues. Meetings may be convened to focus on specific systems or issues and invited attendees will be selected accordingly. These meetings will be held routinely through the course of construction, and whenever practical be conducted as extensions of other scheduled meetings. In the final months of construction, these meetings may be held as frequently as once per week.

3.2 COORDINATION AND SCHEDULING

- A. In general, Functional Testing is conducted after Prefunctional Testing and Startup have been satisfactorily completed, controls have been sufficiently tested, and commissioned systems are fully operational. The CxA is notified before systems and equipment undergo further testing or to verify performance of other components or systems. As part of Prefunctional activities, adjustments are made to provide basic operation at specific levels, flows, and/or conditions. Functional Testing then proceeds methodically from components, to subsystems, to systems. Once the proper performance of all interacting individual systems has been achieved, the interface and coordinated responses between systems is checked.
- B. Contractor shall provide a Letter of Readiness to the CxA (through the OR) prior to Functional Testing stating that the commissioned systems are installed, connected, and otherwise ready for testing per the PFCs.
- C. Contractor and Subs shall provide a minimum of fourteen (14) days notice to the CxA regarding their scheduled dates for installation, Startup, Prefunctional Checks, and TAB tasks for all related equipment and systems. Additionally, Contractor and Subs shall accommodate CxA's tasks of inspecting work, witnessing Prefunctional Checks

and Startup procedures, and any other associated tasks related to the commissioned systems.

- D. The CxA shall provide a minimum of fourteen (14) days notice to the OR, GC and affected Subs for scheduling of Functional Performance Tests. The CxA shall direct, witness and document the Functional Testing of all equipment and systems. The installing Sub(s) shall execute the tests.

3.3 DEFICIENCIES AND NON-CONFORMANCE

- A. The CxA shall produce and maintain a project-specific Issues Log to capture any deficiencies or non-conformance of the commissioned systems. The Log will be updated throughout the project and will track issues from discovery through resolution by the responsible party (or acceptance by the Owner). The Issues Log shall become a permanent record in the Final Cx Report.
- B. The installing Sub, vendor, or other responsible party shall, in a timely manner, correct all items that are deficient or incomplete in the PFCs and FPTs, and shall notify the CxA as soon as outstanding items have been corrected. The CxA shall update the Issues Log as necessary to reflect the corrections.
- C. The CxA may assist with problem resolution regarding non-conformance and deficiencies, but ultimately that responsibility resides with the design/construction management team, Contractor, Subs, and vendors.
- D. Items left incomplete which later cause deficiencies or delays during Functional Testing may result in backcharges to the responsible contractor.
- E. Retesting
 - 1. The CxA is responsible for initial testing and up to one (1) retest of included equipment/systems. Any items that fail upon retest shall be corrected and retested at Contractor's expense.
 - 2. Retesting of deficiencies determined to be design related shall be the responsibility of the A/E design professionals.
 - 3. Equipment/systems that are found not to be ready for testing (despite receipt of the Contractor's Letter of Readiness) and requiring a separate visit by the CxA will have their initial test considered a retest.

3.4 DEFERRED TESTING

- A. Seasonal Testing: During the warranty period, seasonal testing (testing delayed until weather conditions are closer to the system's design) may be required as part of this contract. The CxA shall coordinate such activity. Tests will be executed by the appropriate Sub(s), and witnessed/documentated by the CxA. Any identified

deficiencies shall be corrected by the Sub, and final adjustments made to the O&M manuals, as-builts and Cx Report.

- B. Unforeseen Deferred Tests: If any check or test cannot be completed due to the building structure, required occupancy condition or other issue, completion of PFCs and FPTs may be delayed upon approval of the OR. These tests will be conducted in the same manner as the seasonal tests, and as soon as practical. Services of necessary parties will be negotiated.

3.5 TRAINING

- A. The CxA shall be responsible for overseeing and approving the content and adequacy of Owner personnel training for commissioned equipment and systems.
- B. The GC shall be responsible for training coordination and scheduling, and ultimately for ensuring that complete training is provided. The CxA shall document completion of training per the Contract Documents.
- C. Adequate copies of the standard operating manual for all system(s) and any special training manuals will be available for each trainee, three (3) copies of these documents will be retained for the O&M manuals. In addition, any system technical manual(s) will be reviewed as part of training, and three (3) copies retained for the O&M manuals. Training materials shall cover all control sequences and include a definitions section that fully describes all relevant terms and abbreviations. Training materials shall be approved by the CxA.

END OF SECTION

SECTION 05 3000 METAL DECK

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. Division 01 Section 018113 "Sustainable Design Requirements"

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof deck.
 - 2. Floor deck.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete fill and reinforcing steel.
 - 2. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
- C. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
 - 1. Mechanical fasteners.
- F. LEED Product Data
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weights of post-consumer recycled content, include statement indicating cost for each product having recycled content.
 - 2. Product Data for Credit MR 5: For products and materials required to comply with requirements for regional materials, provide certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed steel deck 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.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- C. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- D. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."
- E. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on **platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.**

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. Steel Deck:
 - a. BHP Steel Building Products USA Inc.
 - b. Consolidated Systems, Inc.
 - c. Epic Metals Corp.
 - d. Marlyn Steel Products, Inc.
 - e. Nucor Corp.; Vulcraft Div.
 - f. Roof Deck, Inc.
 - g. United Steel Deck, Inc.
 - h. Verco Manufacturing Co.
 - i. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 ROOF DECK METAL DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
1. Prime-Painted Steel Sheet at Areas with Insulation only: ASTM A 611, Grade C minimum, shop primed with gray or white baked-on, lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.
 2. Galvanized Steel Sheet at Areas with Lightweight Concrete and Insulation: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 3. Deck Profile: Type WR, wide rib.
 4. Side Laps: Overlapped.

2.3 COMPOSITE FLOOR DECK

- A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:
1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Pour Stops and Girder Fillers: Steel sheet, minimum yields strength of 33,000 psi, of same material and finish as deck, and of thickness and profile.
- H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- I. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

1910

- J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

1910

- K. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- L. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.
- M. Galvanizing Repair Paint: ASTM A 780.
- N. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.
- B. Locate decking bundles to prevent overloading of supporting members.
- C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
- F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- H. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF DECK INSTALLATION

- A. Fasten roof deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter, but not less than 1-1/2 inches long, and as indicated on drawings:
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated.

- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and weld flanges to top of deck. Space welds not more than 12 inches apart with at least 1 weld at each corner.
- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR DECK INSTALLATION

- A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Spacing: Space and locate welds as indicated.
- B. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches with end joints as follows:
 - 1. End Joints: Butted
- C. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- D. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.
- E. Install piercing hanger tabs not more than 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

- A. Field welds will be subject to inspection.
- B. Remove and replace work that does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

SECTION 05 4000**COLD-FORMED STRUCTURAL METAL FRAMING****PART 1 - GENERAL****RELATED DOCUMENTS**

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

Division 01 Section 018113 "Sustainable Design Requirements"

SUMMARY

This Section includes the following:

Exterior load-bearing wall framing.

Interior load-bearing wall framing.

DEFINITIONS

Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

SUBMITTALS

Product Data: For each type of cold-formed metal framing product and accessory indicated.

Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.

Welding Certificates: Copies of certificates for welding procedures and personnel.

QUALITY ASSURANCE

Installer Qualifications: An experienced installer who has completed cold-formed metal framing 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.

Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.

Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.

Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

DELIVERY, STORAGE, AND HANDLING

Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PRODUCTS

1 MANUFACTURERS

2 Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed
3 metal framing that may be incorporated into the Work include, but are not limited to, the following:

- 4 Allied American Studco, Inc.
- 5 Angeles Metal Systems.
- 6 California Expanded Metal Products Co.
- 7 California Metal Systems, Inc.
- 8 Clark Steel Framing Industries.
- 9 Consolidated Fabricators Corp.
- 10 Consolidated Systems, Inc.
- 11 Dale Industries, Inc.
- 12 Design Shapes in Steel.
- 13 Dietrich Industries, Inc.
- 14 Knorr Steel Framing Systems.
- 15 MarinoWare; Div. of Ware Industries, Inc.
- 16 Scafco Corp.
- 17 Steel Construction Systems.
- 18 Steel Developers, LLC.
- 19 Steeler, Inc.
- 20 Studco of Hawaii, Inc.
- 21 Super Stud Building Products, Inc.
- 22 Unimast, Inc.
- 23 United Metal Products, Inc.
- 24 Western Metal Lath.

25 MATERIALS

26 Steel Sheet: ASTM A 570/A 570M, hot rolled or ASTM A 611, cold rolled; cleaned, pretreated, and
27 primed with manufacturer's baked-on, lead and chromate-free, rust-inhibitive primer complying with
28 performance requirements in FS TT-P-664, of grade as follows:

29 Grade: 33, for minimum uncoated steel thickness of 0.0428 inch and less, 50 for minimum
30 uncoated steel thickness of 0.0538 inch and greater.

31 WALL FRAMING

32 Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with
33 stiffened flanges, complying with ASTM C 955, and as follows:

34 Minimum Uncoated-Steel Thickness: As indicated.

35 Flange Width: 1-5/8 inches.

36 Section Properties: As indicated.

37 Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with
38 straight flanges, complying with ASTM C 955, and as follows:

39 Minimum Uncoated-Steel Thickness: Matching steel studs.

40 Flange Width: 1-1/4 inches.

41 FRAMING ACCESSORIES

1 Fabricate steel-framing accessories of the same material and finish used for framing members, with a
2 minimum yield strength of 33,000 psi.

3 Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated,
4 as follows:

5 Supplementary framing.

6 Bracing, bridging, and solid blocking.

7 Web stiffeners.

8 End clips.

9 Foundation clips.

10 Gusset plates.

11 Stud kickers, knee braces, and girts.

12 Joist hangers and end closures.

13 Hole reinforcing plates.

14 Backer plates.

15 ANCHORS, CLIPS, AND FASTENERS

16 Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.

17 Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without
18 failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a
19 qualified independent testing agency.

20 Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from
21 corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design
22 load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

23 Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.

24 Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

25 Welding Electrodes: Comply with AWS standards.

26 MISCELLANEOUS MATERIALS

27 Galvanizing Repair Paint: ASTM A 780.

28 Retain appropriate grout from two paragraphs below if concrete or masonry substrates require leveling
29 before setting track or prefabricated assemblies.

30
31
32 Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at
33 ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and
34 hydration.

35 Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing
36 selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-
37 reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

38 FABRICATION

39 Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with
40 connections securely fastened, according to manufacturer's written recommendations and requirements
41 in this Section.

42 Fabricate framing assemblies using jigs or templates.

43 Cut framing members by sawing or shearing; do not torch cut.

- 1 Fasten cold-formed metal framing members by welding. Wire tying of framing members is not
2 permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and
3 quality of welds, and methods used in correcting welding work.
- 4 Fasten cold-formed metal framing members by welding or screw fastening, as standard with
5 fabricator. Wire tying of framing members is not permitted.
- 6 Comply with AWS D1.3 requirements and procedures for welding, appearance and quality
7 of welds, and methods used in correcting welding work.
- 8 Locate mechanical fasteners and install according to Shop Drawings, with screw
9 penetrating joined members by not less than three exposed screw threads.
- 10 Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening,
11 according to Shop Drawings.
- 12 Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses.
13 Lift fabricated assemblies to prevent damage or permanent distortion.
- 14 Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable
15 tolerance variation of 1/8 inch in 10 feet and as follows:
- 16 Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from
17 plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing
18 or other finishing materials.
- 19 Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square
20 tolerance of 1/8 inch (3 mm).
- 21 EXECUTION
- 22 EXAMINATION
- 23 Examine supporting substrates and abutting structural framing for compliance with requirements for
24 installation tolerances and other conditions affecting performance. Proceed with installation only after
25 unsatisfactory conditions have been corrected.
- 26 PREPARATION
- 27 Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing,
28 or tracks to structural members indicated to receive sprayed fire-resistive materials.
- 29 After applying sprayed fire-resistive materials, remove only as much of these materials as needed to
30 complete installation of cold-formed framing without reducing thickness of fire-resistive materials below
31 that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from
32 damage.
- 33 Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on
34 supporting concrete or masonry construction.
- 35 INSTALLATION, GENERAL
- 36 Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- 37 Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are
38 indicated.
- 39 Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
- 40 Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line
41 joints with maximum variation in plane and true position between fabricated panels not exceeding
42 1/16 inch.
- 43 Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections
44 securely fastened, according to manufacturer's written recommendations and requirements in this
45 Section.
- 46 Cut framing members by sawing or shearing; do not torch cut.

- 1 1. Fasten cold-formed metal framing members by welding or screw fastening, as standard
2 with fabricator. Wire tying of framing members is not permitted.
- 3 Comply with AWS D1.3 requirements and procedures for welding, appearance and quality
4 of welds, and methods used in correcting welding work.
- 5 Locate mechanical fasteners and install according to Shop Drawings, with screw
6 penetrating joined members by not less than three exposed screw threads.
- 7 Install framing members in one-piece lengths, unless splice connections are indicated for track or
8 tension members.
- 9 Install temporary bracing and supports to secure framing and support loads comparable in intensity to
10 those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire
11 integrated supporting structure has been completed and permanent connections to framing are secured.
- 12 Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame
13 both sides of joints.
- 14 Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple
15 studs at openings, that are inaccessible on completion of framing work.
- 16 Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard
17 punched openings.
- 18 Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum
19 allowable tolerance variation of 1/8 inch in 10 feet and as follows:
- 20 Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location.
21 Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing
22 materials.

23 WALL INSTALLATION

- 24 Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely
25 anchor at corners and ends, and at spacing as follows:
- 26 Anchor Spacing: As indicated.
- 27 Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and
28 bottom tracks. Space studs as follows:
- 29 Stud Spacing: As indicated.
- 30 Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped
31 surfaces and similar configurations.
- 32 Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be
33 aligned, continuously reinforce track to transfer loads.
- 34 Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track
35 to transfer loads.
- 36 Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as
37 indicated.
- 38 Install headers over wall openings wider than stud spacing. Locate headers above openings as
39 indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting
40 studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
- 41 Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop
42 Drawings.
- 43 Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs
44 with clip angles or by welding, and space jack studs same as full-height wall studs.
- 45 Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures,
46 equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to
47 framing.

- 1 If type of supplementary support is not indicated, comply with stud manufacturers written
2 recommendations and industry standards in each case, considering weight or load resulting from
3 item supported.
- 4 Install horizontal bridging in stud system, spaced 48 inches apart. Fasten at each stud intersection.
- 5 Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs
6 with a minimum of two screws into each flange of the clip angle.
- 7 Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-
8 track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and
9 secure solid blocking to stud webs or flanges.
- 10 Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top
11 and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to
12 structure.
- 13 Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip
14 angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing
15 system.
- 16 **FIELD QUALITY CONTROL**
- 17 Testing: The Owner shall engage a qualified independent testing agency to perform field quality-control
18 testing and inspections. The contractor shall schedule with the testing agency in a timely manner, when
19 tests and inspections are required to be performed.
- 20 Field and shop welds will be subject to inspection and testing.
- 21 Testing agency will report test results promptly and in writing to Contractor and Architect.
- 22 Remove and replace Work that does not comply with specified requirements.
- 23 Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance
24 of corrected Work with specified requirements.
- 25 **REPAIRS AND PROTECTION**
- 26 Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-
27 formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written
28 instructions.
- 29 Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and
30 installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint
31 used on adjacent surfaces.
- 32 Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by
33 covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply
34 covering immediately after sheathing is installed.
- 35 Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape
36 recommended by sheathing manufacturer at time sheathing is applied.
- 37 Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer
38 that ensure cold-formed metal framing is without damage or deterioration at time of Substantial
39 Completion.
- 40 **END OF SECTION**

1 SECTION 06 1000 - ROUGH CARPENTRY

2
3 PART 1 - GENERAL

4
5 RELATED DOCUMENTS:

6
7 Drawings and general provisions of Contract, including General and Supplementary Conditions and
8 Division 1 Specification sections, apply to work of this section.

9
10 Section 01 8113 – Sustainable Design Requirements (LEED Projects)

11
12 SCOPE OF WORK:

13
14 Types of work in this section include rough carpentry for:

15
16 Blocking and cants for roofing system and related flashings. Provide 5 ½" wide by full depth of
17 insulation blocking at all penetrations and edges of rigid insulation roof assemblies when required
18 by roofing manufacturer for 20 year NDL warranty.

19
20 Fire retardant wood rooftop equipment bases and support curbs.

21
22 Behind wall wood blocking for support of washroom accessories, wall cabinets and grab bars.

23
24 Fire retardant wood grounds, nailers and blocking.

25
26 Miscellaneous furring for wall finishes.

27
28 Sheet metal backup for mounting miscellaneous items.

29
30 Finish carpentry is specified in another section within Division 6.

31
32 SUBMITTALS:

33
34 Product Data: Manufacturer's data sheets on each product to be used, including:

35
36 Preparation instructions and recommendations.

37
38 Storage and handling requirements and recommendations.

39
40 Installation methods.

41
42 LEED Submittal Requirements:

43
44 Provide the following on LEED certified projects:

45
46 Provide Forest Stewardship Council Chain of Custody Certification for lumber and construction
47 panels and documentation of cost of material from the materials supplier. The material supplier

1 must have FSC certification in order to supply chain-of-custody certificates. Provide list of possible
2 vendors to architect's LEED consultant for pre-approval.

3
4 Certification that products in this section will comply with VOC limitations listed in Division 1 LEED
5 Requirements.

6
7 Certification that products in this section will contain no urea-formaldehyde.
8

9 DEFINITIONS:

10
11 Rough carpentry includes carpentry work not specified as part of other sections and which is generally
12 not exposed, except as otherwise indicated.

13
14 Material Certificates: Where dimensional lumber is provided to comply with minimum allowable unit
15 stresses, submit listing of species and grade selected for each use, and submit evidence of compliance
16 with specified requirements. Compliance may be in form of a signed copy of applicable portion of lumber
17 producer's grading rules showing design values for selected species and grade. Design values shall be as
18 approved by the Board of Review of American Lumber Standards Committee.

19
20 Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling,
21 storing, installation and finishing of treated material.

22
23 Fire-Retardant Treatment: Include certification by treating plant that treated material complies
24 with specified standard and other requirements.

25 26 PRODUCT HANDLING:

27
28 Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and
29 contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air
30 circulation within and around stacks and under temporary coverings including polyethylene and similar
31 materials.

32 33 PROJECT CONDITIONS:

34
35 Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate
36 location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

37 38 PART 2 - PRODUCTS

39 40 LUMBER, GENERAL:

41
42 Lumber Standards: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard"
43 and with applicable grading rules of inspection agencies certified by American Lumber Standards
44 Committee's (ALSC) Board of Review.

45
46 Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades
47 and species include the following:
48

1 SPIB - Southern Pine Inspection Bureau.
2 WCLIB - West Coast Lumber Inspection Bureau.
3 WWPA - Western Wood Products Association.
4

5 Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing
6 compliance with grading rule requirements and identifying grading agency, grade, species, moisture
7 content at time of surfacing, and mill.
8

9 Fire-Retardant Treatment: Use fire-retardant treated wood ("FRTW") throughout the project. Pressure
10 impregnate lumber and plywood with fire-retardant chemicals to comply with AWPA C20 and C27,
11 respectively, for treatment type indicated below; identify "FRTW" lumber with appropriate classification
12 marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection or other testing and
13 inspecting agency acceptable to authorities having jurisdiction.
14

15 Interior Type A: Use where "FRTW" wood is indicated for interior applications.
16

17 Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.
18

19 Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS
20 20, for moisture content specified for each use.
21

22 Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment
23 for sizes 2" or less in nominal thickness, unless otherwise indicated.
24

25 MISCELLANEOUS LUMBER: 26

27 Provide wood for support or attachment of other work including rooftop equipment curbs and support
28 bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide
29 lumber of sizes indicated, worked into shapes shown, and as follows:
30

31 Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative
32 treatment.
33

34 Species and Grade: "Number 2 and Better" Hem-Fir, except where a higher grade and species is called for
35 on the Drawings.
36

37 CONSTRUCTION PANELS: 38

39 Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial
40 Plywood" for plywood panels and, for products not manufactured under PS 1 provisions, with American
41 Plywood Associates (APA) "Performance Standard and Policies for Structural-Use Panels", Form No. E445.
42

43 Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade
44 requirements.
45

46 Concealed APA Performance-Rated Panels: Where construction panels will be used for the following
47 concealed types of applications, provide APA Performance-Rated Panels complying with requirements

1 indicated for grade designation, span rating, exposure durability classification, edge detail (where
2 applicable) and thickness.

3
4 Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated
5 plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated,
6 or, if not otherwise indicated, not less than 3/4".

7
8 ROOFING ASSEMBLIES:
9 Provide products as specified for carpentry related to roofing assemblies.

10
11 NAILERS:
12
13 All nailers shall be #2 or better, construction grade lumber, FRTW.
14 Size to be as indicated on the drawings.
15 Minimum nailer size shall be 2" x 6" (nominal)
16 Minimum top nailer thickness shall be 1-1/2" (nominal)
17 Nailers shall extend 1/2" beyond metal flanges.

18
19 PLYWOOD:
20
21 All plywood is to be minimum 1/2", APA Rated Exterior, Structural 1, FRTW.
22
23 Only waterproof glue is acceptable.
24
25 Refer to drawings for plywood thickness at each detail.

26
27 CARBON STEEL FASTENERS:
28
29 All fasteners must be carbon steel with corrosion-resistant coating. Fasteners shall meet FM 4470.

30
31 MASONRY/CONCRETE FASTENERS:
32
33 Corrosion-resistant, threaded fastener with low profile head.
34
35 Fasteners shall be a minimum of 3/16" diameter with a 1" minimum embedment.
36
37 Fastener to be FM Global approved.

38
39 Approved Products:
40 Tapcon Flat-Head Phillips with Blue Climaseal or White UltraShield by ITW Buildex
41 Tapper Flat-Head Phillips with Perma-Seal Coating by Powers Fasteners, Inc.

42
43 STEEL/WOOD FASTENERS:
44
45 Corrosion-resistant, self-tapping, self-drilling screw with low profile head.
46
47 Fastener to be FM Global approved.

48

1 Approved Products:
 2 Roof Grip by OMG with Climaseal Coating
 3 Dekfast by SFS Intec, Inc., with Sentri Coating
 4 Standard roofing fastener by OMG, with CR-10 coating.

5
 6 Fasteners to be #12 minimum and of sufficient length to penetrate into steel 3/4" and wood 1".
 7

8 GYPSUM/CEMENTITIOUS WOOD FIBER DECKING:
 9

10 Corrosion-resistant, 1/4" toggle bolt with low profile head. Fastener to be carbon steel with fluorocarbon,
 11 corrosion-resistant coating.

12
 13 Fastener shall be FM Global approved.
 14

15 Approved Products:
 16 Speed-Lock Toggle by Powers Fasteners, Inc.
 17 Iron-Lok Toggle bolt by OMG
 18

19 Fastener shall be of sufficient length to penetrate deck as required for proper application, in accordance
 20 with manufacturer's recommendations.
 21

22 WASHERS:
 23

24 Round, carbon steel, Federal Specification FF-2-92. Minimum diameter 5/8".
 25

26 MISCELLANEOUS MATERIALS:
 27

28 Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by
 29 applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts,
 30 nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type
 31 recommended by the manufacturer for each use including recommended nails.
 32

33 Sheet Metal Backup: At Contractor's option, 16 gage galvanized sheet metal backup may be substituted
 34 for wood blocking shown on Drawings. Sheet metal panel screwed to studs must extend not less than 3"
 35 above highest fastener and not less than 3" below lowest fastener of item mounted. Sheet metal panel
 36 must extend not less than 3" beyond the next stud on either side of the item mounted.
 37

38 PART 3 - EXECUTION
 39

40 INSTALLATION, GENERAL:
 41

42 Discard units of material with defects which might impair quality of work, and units which are too small
 43 to use in fabricating work with minimum joints or optimum joint arrangement.
 44

45 Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.
 46

47 Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by
 48 recognized standards.

1
2 Countersink nail heads on exposed carpentry work and fill holes.

3
4 Use buglehead self-tapping screws, except as otherwise indicated. Use finishing nails for finish work.
5 Select fasteners of size that will not penetrate members where opposite side will be exposed to view or
6 will receive finish materials. Make tight connections between members. Install fasteners without splitting
7 of wood; predrill as required.

8
9 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS:

10
11 Provide wherever shown and where required for screeding or attachment of other work. Form to shapes
12 as shown and cut as required for true line and level of work to be attached. Coordinate location with
13 other work involved.

14
15 Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with
16 surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where
17 possible, anchor to formwork before concrete placement.

18
19 INSTALLATION OF CONSTRUCTION PANELS:

20
21 General: Comply with applicable recommendations contained in Form No. E 30F, "APA
22 Design/Construction Guide - Residential & Commercial," for types of plywood products and applications
23 indicated.

24
25 Fastening Methods: Fasten panels as indicated below:

26
27 Plywood Backing Panels: Screw to supports.

28
29 NAILERS:

30
31 Nailers are to be installed as per detail drawings.

32 Discard units of material with defects that might impair quality of work and units that are too small to use
33 in fabricating work with minimum joints or optimum joint arrangement.

34
35 Set nailers to required levels and lines with members plumb and true.

36
37 All perimeter nailers shall be of uniform height within a given roof section.

38
39 Nailers shall be installed with 1/4" gap between ends of adjoining pieces.

40
41 Stacked nailers shall have the joints staggered a minimum of 24".

42
43 Nailers shall be fastened in accordance with the following schedule:

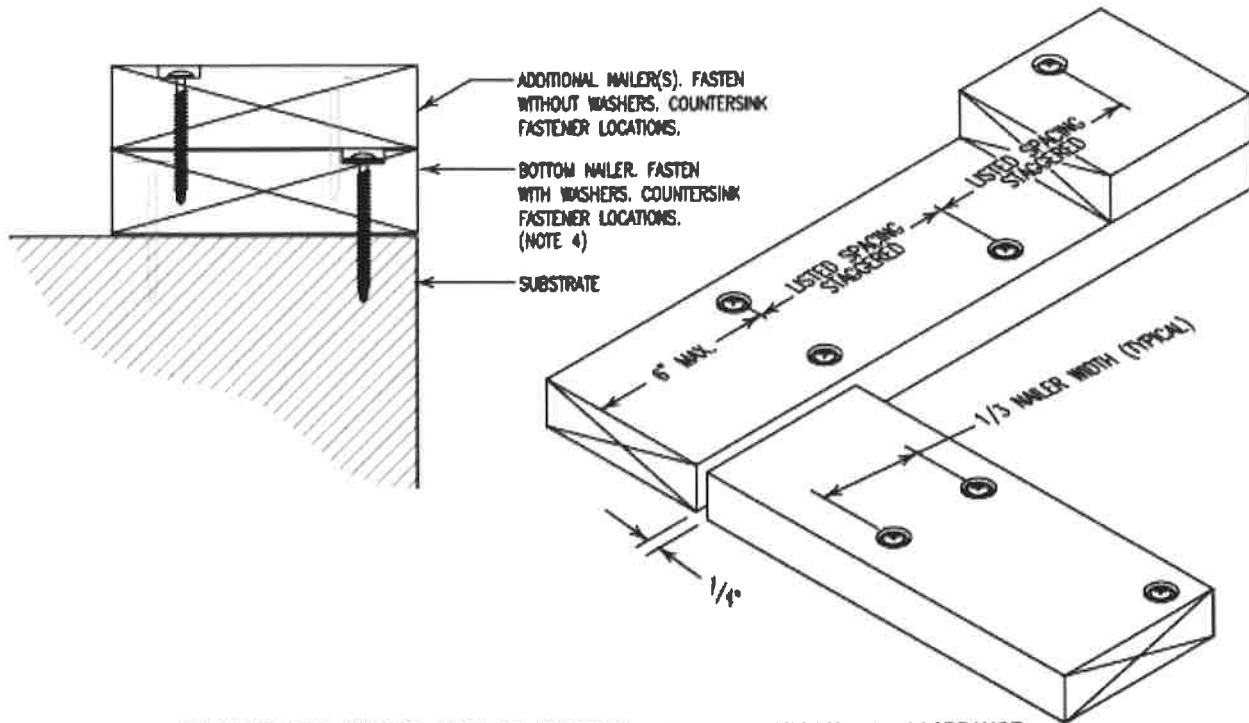
44
45 Fasteners in 6" or wider (nominal) lumber shall be installed in two (2) rows, staggered on-third of nailer
46 width. Listed spacing's indicate distance between fasteners in adjacent rows.

47
48 Two (2) fasteners shall be installed within 6" of each nailer end.

- 1
2 Corner fastener spacing shall extend 8' from all outside building corners.
3
4 Where two or more nailers are installed, each nailer shall be fastened independently.
5
6 Over all deck types, the bottom nailer shall be fastened using the specified fasteners and 5/8" diameter
7 washers. Countersink washers and fasteners level with top of wood using spade bit or similar method.
8 Fasten subsequent nailers, where specified, using the specified screws without washers.
9
10 Nailer Attachment Schedule (unless noted otherwise on the drawings)
11

Attachment Substrate	Perimeter Fastener Spacing (maximum)	Corner Fastener Spacing (maximum)
Structural Concrete	12" o. c.	6" o. c.
CMU (fastener into solid material)	12" o. c.	6" o. c.
Steel Deck	12" o. c.	6" o. c.
Wood	12" o. c.	6" o. c.

- 12
13 PLYWOOD:
14 Plywood is to be installed as per detail drawings.
15
16 Plywood joints must be true and well fitting, allowing for expansion and contraction. Allow 1/8" at end
17 and edge joints.
18
19 Plywood fasteners shall be installed in a uniform grid pattern, with a maximum spacing of 18" o. c.
20 between adjacent fasteners.
21
22



ALL PERIMETER NAILERS, NEW OR EXISTING SHALL BE FASTENED IN ACCORDANCE WITH THE FOLLOWING SCHEDULE (UNLESS NOTED OTHERWISE ON DETAIL DRAWINGS)

ATTACHMENT SUBSTRATE	PERIMETER FASTENER SPACING (MAXIMUM)	CORNER FASTENER SPACING (MAXIMUM)
STRUCTURAL CONCRETE	12" O.C.	6" O.C.
CMU (FASTENER INTO SOLID MATERIAL)	12" O.C.	6" O.C.
STEEL DECK	12" O.C.	6" O.C.
WOOD	12" O.C.	6" O.C.

NOTES:

1. FASTENERS IN 6" OR WIDER (NOMINAL) LUMBER SHALL BE INSTALLED IN TWO (2) ROWS, STAGGERED 1/3 OF NAILER WIDTH.
 2. TWO (2) FASTENERS SHALL BE INSTALLED WITHIN 6" OF EACH NAILER END.
 3. CORNER FASTENER SPACING SHALL EXTEND 8" FROM ALL OUTSIDE BUILDING CORNERS.
 4. WHERE TWO OR MORE NAILERS ARE INSTALLED, EACH NAILER SHALL BE FASTENED INDEPENDENTLY.
 5. OVER ALL DECK TYPES, THE BOTTOM NAILER SHALL BE FASTENED USING THE SPECIFIED FASTENERS AND 5/8" DIAMETER WASHERS, COUNTERSINK WASHERS AND FASTENERS LEVEL WITH TOP OF WOOD USING SPADE BIT OR SIMILAR METHOD. FASTEN SUBSEQUENT NAILERS, WHERE SPECIFIED, USING THE SPECIFIED SCREWS WITHOUT WASHERS.
 6. FASTENER TYPES ARE DETERMINED BY SUBSTRATE MATERIALS AND SECTION 06100 ROUGH CARPENTRY.
 7. NAILERS SHALL BE INSTALLED WITH 1/4" GAP BETWEEN ENDS OF ADJOINING PIECES.
 8. REFER TO SECTION 06100 FOR ADDITIONAL REQUIREMENTS.
- 9 SCREWS SHOWN IN THIS DIAGRAM ARE IN ADDITION TO ANCHOR BOLTS CALLED OUT IN STRUCTURAL DETAILS

NAILER ATTACHMENT GUIDELINES AT PERIMETER

1
2 END OF SECTION 06 1000

1 SECTION 07 2100 - THERMAL INSULATION

2

3 PART 1 - GENERAL:

4

5 Related Sections:

6 Section 01 8113 – Sustainable Design Requirements (LEED Projects)

7

8 Specified Elsewhere: Rigid roof insulation is specified in Built-Up Roofing System specification.

9

10 Thermal resistivity or "r-value" represents the reciprocal of thermal conductivity (k-value), which is the
11 rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are
12 expressed by the temperature difference in degrees F between the two exposed faces required to cause
13 one BTU to flow through one sq. ft. per hour at mean temperatures indicated.

14

15 Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire
16 performance characteristics have been determined per ASTM E 119, ASTM E 84, and ASTM E 136, as
17 applicable, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction.
18 Identify products with appropriate markings of applicable testing and inspecting organization.

19

20 Submittals: Submit product data for each form and type of insulation indicated.

21

22 LEED Submittal Requirements:

23

24 Provide the following on LEED certified projects:

25

26 Certification of quantity of recycled content in materials from this section and documentation of cost of
27 the material.

28

29 Certification of regionally extracted, harvested, or recovered, manufactured and fabricated within 500
30 miles of project site, and documentation of cost of the material.

31

32 Provide certified letter from materials manufacturer listing material origin.

33

34 Certification that products in this section will comply with VOC limitations listed in Division 1 LEED
35 Requirements.

36

37 Certification: Provide Contract Conformance certification for products, assemblies, accessories and
38 installation.

39

40 PART 2 - PRODUCTS:

41

42 General: Provide preformed units in sizes to fit applications indicated, selected from manufacturer's
43 standard thicknesses, widths, and lengths.

44

45 Rigid Insulation:

46

47 Extruded Polystyrene Board Insulation: ASTM C 578, type as indicated below; with 5-year aged r-

1 values of 5.4 and 5 at 40 and 75 deg F (4.4 and 23.9 deg C), respectively; and as follows:

2
3 Type IV, 25 psi compressive strength.

4
5 Thickness: 1-1/2" unless shown otherwise on Drawings.

6
7 Surface Burning Characteristics: Maximum flame spread and smoke developed values of 75 and 450.

8
9 Acoustic Insulation:

10
11 Unfaced Mineral Fiber Blanket/Batt Insulation: ASTM C 665 for Type I (blankets without membrane
12 facing); and as follows:

13
14 Mineral Fiber Type: Fibers manufactured from glass or slag.

15
16 Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50.

17
18 Typical Building Insulation: At all locations in building not noted otherwise on Drawings.

19
20 Faced Mineral Fiber Blanket/Batt Insulation: ASTM C 665 for Type III, Class A; foil-scrim-kraft or foil-
21 scrim-polyethylene vapor-retarder membrane on one face; and as follows:

22
23 Mineral Fiber Type: Fibers manufactured from glass or slag.

24
25 Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50,
26 respectively.

27
28 Option: At Contractor's option batts may be unfaced and covered with 4' wide roll stock of FSK-25
29 material.

30
31 PART 3 - EXECUTION

32
33 General: Comply with insulation manufacturer's instructions for installation of insulation.

34
35 Support insulation units by adhesive or mechanical anchorage or both as applicable to location and
36 conditions indicated. Where shown on Drawings, support batt insulation under roof deck with steel tension
37 bands at 24" o.c.

38
39 Install products in accordance with manufacturer's instructions.

40
41 Install batting made to fit tightly in all building cavities. Pack door and window lintels and jambs with batting
42 cut-to-fit.

43
44 Completely cover all batting with FSK-25 vapor barrier. Provide continuous wrap around all details. Tape all
45 seams, edges and penetrations.

46
47 Install protection board course over insulation before backfilling against or placing cast-in-place concrete

1910

- 1 against insulation.
- 2
- 3 END OF SECTION 07 2100

1 SECTION 07 6000 - FLASHING AND SHEET METAL

2
3 PART 1 - GENERAL

4
5 RELATED DOCUMENTS

6
7 Drawings and general provisions of Contract, including General and Supplementary Conditions and
8 Division 1 Specification Sections, apply to work of this Section.

9
10 Section 01 8113 – Sustainable Design Requirements (LEED Projects)

11
12 SCOPE OF WORK

13
14 Scope of work includes a complete outfit of flashing and sheet metal to weatherproof the buildings and
15 to produce a complete, consistent appearance. Contractor shall furnish and install all flashing and sheet
16 metal work necessary to produce a complete architectural sheet metal system throughout the buildings.
17 For conditions not shown on details, submit samples of Contractor-recommended sections, designed to
18 be consistent with details shown on the Drawings.

19
20 SUMMARY

21
22 This Section includes the following:

23
24 Sheet metal flashing and base flashing (if any).

25
26 Miscellaneous sheet metal accessories.

27
28 Stainless steel wainscot.

29
30 Integral masonry flashings are specified as masonry work in sections of Division 4.

31
32 Roofing accessories installed integral with roofing membrane are specified in roofing system sections as
33 roofing work.

34
35 Roof accessory units of premanufactured, set-on type are specified in Division 7 Section "Roof
36 Accessories."

37
38 SUBMITTALS

39
40 This submittal shall be reviewed in conjunction with the roof system with certification by the parties that
41 the products and application are compatible and in conformance with the system design and guarantee,
42 as the work relates to the roof.

43
44 General: Submit the following in accordance with Conditions of Contract and Division 1 Specification
45 Sections.

1 Product data, Flashing, Sheet Metal, and Accessories: Manufacturer's technical product data, installation
2 instructions and general recommendations for each specified sheet material and fabricated product.
3 Maximum allowable VOC for membrane sealant: 450 gt/L.

4
5 Samples of the following flashing, sheet metal, and accessory items:

6
7 8-inch-square samples of specified sheet materials to be exposed as finished surfaces.

8
9 12-inch-long full-size samples of all flashing sections to be used on the job. Provide complete with
10 specified factory finish where required.

11
12 LEED Submittal Requirements:

13
14 Provide the following on LEED certified projects:

15
16 Product Data for Credit MR 4: For products having recycled content, documentation indicating
17 percentages by weights of post-consumer recycled content. Include statement indicating cost
18 for each product having recycled content.

19
20 Product Data for Credit MR 5: For products and materials required to comply with requirements
21 for regional materials, provide certificates indicating location of material manufacturer and
22 point of extraction, harvest, or recovery for each raw material. Include statement indicating
23 distance to Project, cost for each regional material, and fraction by weight that is considered
24 regional.

25
26 Certification that products in this section will comply with VOC limitations listed in Division 1 LEED
27 Requirements.

28
29 PROJECT CONDITIONS

30
31 Coordinate work of this section with interfacing and adjoining work for proper sequencing of each
32 installation. Ensure best possible weather resistance and durability of work and protection of materials
33 and finishes.

34
35 PART 2 - PRODUCTS

36
37 PREFABRICATED PREFINISHED COMPONENTS

38
39 Prefabricated Components: Provide all sheet metal work visible from the exterior of the building, i.e.
40 fascia, gutters, downspouts and copings by Custom Metal Products of NM, Midtown Metals of NM, Newt
41 & Butch of NM, or Allen Roofing of NM in gages and sizes shown on drawings, and as required for ES-1
42 Compliance, whichever is heavier gauge.

43
44 Prefinished Material: Provide material factory finished with Kynar 500 or Hylar 500 paint for all sheet
45 metal work visible on the exterior of the building. Provide all manufacturers' standard colors, 24 gate.

46
47 Metal Copings: Provide as follows:
48

- 1 Fully supported by tapered FRTW wood rippers full width and length of parapet. Metal chairs will
- 2 not be accepted.
- 3
- 4 Continuous cleats front and back of parapet.
- 5
- 6 No exposed fasteners on front side of parapet. Exposed fasteners on backside only.
- 7
- 8 Concealed splice plates with 1/2" sealed expansion gap.
- 9

10 SHEET METAL FLASHING AND TRIM MATERIALS

11

12 Code Compliance: All edge flashing, fascia, and copings shall be designed and installed in accordance with

13 ANSI/SPR1 ES-1 per IBC 2003 1504.5.

14

15 Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-

16 forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359-inch thick (20

17 gage) except as otherwise indicated.

18

19 Sheet Aluminum: ASTM B 209, alloy 3003, temper H14, AA-C22A41 clear anodized finish; 0.0625-inch

20 thick (1/16") except as otherwise indicated.

21

22 Perforated Sheet: Provide perforated aluminum sheet by Perforated Metals Plus, 1-800-220-8952, clear

23 anodized finish, 8 ga. (1/8" thick), 3/8" diameter holes at 1/2" oc.

24

25 Miscellaneous Materials and Accessories:

26

27 Solder: For use with steel or copper, provide 50 - 50 tin/lead solder (ASTM B 32), with rosin flux.

28

29 Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet

30 manufacturer. Match finish of exposed heads with material being fastened.

31

32 Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of sulfur,

33 compounded for 15-mil dry film thickness per coat.

34

35 Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.

36

37 Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components

38 being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint

39 Sealers."

40

41 Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal

42 manufacturer for exterior/interior nonmoving joints including riveted joints.

43

44 Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant

45 seaming and adhesive application of flashing sheet.

46

47 Paper Slip Sheet: 5-lb. rosin-sized building paper.

48

1 Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated,
2 noncorrosive.

3
4 Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as
5 required for installation of work, matching or compatible with material being installed, noncorrosive, size
6 and gage required for performance.

7
8 Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic
9 flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing
10 sheet.

11
12 Roofing Cement: ASTM D 2822, asphaltic.

13
14 FABRICATED PRODUCTS

15
16 Stainless Steel Wainscot:

17
18 Form from 20 gage 430 stainless steel. Provide folded edges all around. Cross-break in continuous
19 diamond pattern all over. Hang on wall from continuous concealed cleats at top and cement
20 entire area below.

21
22 FABRICATED UNITS

23
24 General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown
25 and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized
26 industry practices. The SMACNA Manual is hereby incorporated in this Specification by reference.
27 Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work,
28 sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit
29 substrates. Comply with material manufacturer instructions and recommendations for forming material.
30 Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and
31 levels indicated, with exposed edges folded back to form hems.

32
33 Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum,
34 tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet
35 joints for additional strength where required.

36
37 Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or
38 would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not
39 less than 1 inch deep, filled with mastic sealant (concealed within joints).

40
41 Sealant Joints: Where movable, nonexpansion type joints are indicated or required for proper
42 performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance
43 with SMACNA standards.

44
45 Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating
46 concealed surfaces at locations of contact, with bituminous coating or other permanent separation as
47 recommended by manufacturer/fabricator.

48

1 Paint Finish, Rain Drainage: Provide paint-lock factory primed galvanized sheet metal for gutters, fascia
2 and similar exposed units scheduled for field painting.

3
4 PART 3 - EXECUTION

5
6 INSTALLATION REQUIREMENTS

7
8 General: Except as otherwise indicated, comply with manufacturer's installation instructions and
9 recommendations and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely
10 in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where
11 possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will
12 be permanently watertight and weatherproof.

13
14 Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood
15 substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.

16
17 Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof
18 performance.

19
20 Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete,
21 furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in
22 masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.

23
24 Install counterflashing in reglets, either by snap-in seal arrangement or by welding in place for anchorage
25 and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant
26 exposure.

27
28 Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for
29 movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints
30 to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal
31 and anchor edges in accordance with manufacturer's recommendations.

32
33 Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams
34 at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.

35
36 Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters.
37 Install "beehive"-type strainer-guard at conductor heads, removable for cleaning downspouts.

38
39 Field cuts shall be neat, plumb and/or square as appropriate, and free of burrs.

40
41 Exposed fasteners, where called for on Shop Drawings shall consistent, in-line, and equally spaced. Notify
42 Architect and obtain approval for any exposed fasteners not shown on Shop Drawings. Lack of prior
43 approvals of exposed fasteners shall be grounds for rejection of sheet metal work.

44
45 Solder all joints of mechanical flashings.

46
47 CLEANING AND PROTECTION

- 1 Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration
- 2 of finishes.
- 3 Protection: Advise Contractor of required procedures for surveillance and protection of flashings and
- 4 sheet metal work during construction to ensure that work will be without damage or deterioration other
- 5 than natural weathering at time of Substantial Completion.
- 6
- 7 END OF SECTION 07 6000

SECTION 075110 – BUILT-UP ASPHALT ROOFING OVER INSULATION PART 1- GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, general project requirements and Division 1 Specifications Sections, apply to this Section.

1.02 SCOPE OF WORK

- A. Provide a complete roof system of insulation; hot mopped felts, cap sheet, flashings, sealants, and accessories.

1.03 BIDDER'S REPRESENTATION

- A. A large part of the value of this work is contained in the bidder's and the bidder's proposed manufacturer's capacity to provide long-term responsibility for the satisfactory performance of the roof. A 20-year, no dollar limit warranty is required. To that end, the following requirements are essential provisions of this specification:
 - 1. By offering a bid for this work, the bidder certifies that he has visited the site and determined that all the conditions of the surrounding and underlying work are consistent with his proposed manufacturer's requirements for the specified warranty. In the event that the bidder discovers any condition of the surrounding and underlying work that would prevent him or his manufacturer from providing the specified warranty, he shall report it to the design professional not less than ten (10) days before the bid opening.
 - 2. By offering a bid for this work, the bidder certifies that he has examined the Contract Documents and has found all the details and requirements of the scope of work are complete and consistent with his proposed manufacturer's requirements for the specified warranty. In the event that the bidder discovers any detail or requirement in the Contract Documents that would prevent him or his manufacturer from providing the specified warranty, he shall report it to the design professional not less than ten (10) days before the bid opening.
 - 3. By offering a bid for this work, the bidder certifies that he can, within ten (10) calendar days of a notice of award from the Owner, provide a surety bond for the performance of the work, a surety bond for payment of labor and materials, and a specimen warranty certificate from the manufacturer whose system he proposes to use on the project.

1.04 QUALIFICATIONS

- A. **Manufacturer Qualifications**
 - 1. The manufacturer of the roof system shall be the actual manufacturer of the roofing and insulation component materials, and shall have not less than fifteen (15) years of experience in the production of the specified system.
 - 2. The contractor shall include a certification from the manufacturer, on the manufacturer's letterhead, that the proposed membrane and insulation materials will be produced by the manufacturer of record.
- B. **Installer Qualifications**
 - 1. The installer of the built-up roofing shall have been engaged in the business of installing built-up roofing for not less than five (5) years and shall be experienced in the layout and application of this material. The crew shall be composed of experienced and skilled workers in this work.

1.05 SUBMITTALS

- A. **Shop Drawings:** Submit in accordance with Conditions of Contract and Division 1 Specification Sections, indicating roof size, membrane attachment layout, location, and type of penetrations, perimeter and penetration details, roof insulation make-up and layout.
- B. **Product Data Submittals:** Include manufacturer's technical product data, including UL product listing for each type of insulation, deck, fasteners and roofing product required.
- C. **Fire Resistance:** Provide roofing system, insulation, and component materials that have been tested for application and slopes indicated and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure over decks specified herein.
- D. **Wind Uplift:** Provide rigid insulation, mechanically fastened roofing system, and component materials suitable for the structural deck and that have been tested as a complete system for application and slopes indicated. Provide a complete outfit of submittals ready for review. Allow sufficient time for review of the submittal. Provide fastening for uplift resistance to meet the applicable Building Code but in no case less than ninety (90) psf.

1.06 INSPECTIONS

- A. During the roofing system installation, the Contractor shall take five (5) digital photos daily of the work in progress. The photos shall be forwarded to the Design

Profession and the Owner's Representative on a daily basis with a brief caption of the roofing area being installed and the products being used.

- B. After the roofing system installation is complete, the manufacturer shall inspect the work and inform (by written report) the design professional, contractor, and the installer of defective/incomplete work to be remodeled. Those areas indicated shall be corrected to the full satisfaction of the design professional, Owner, and manufacturer. The manufacturer shall submit written acceptance of the project to the design professional to issuance of the weather-tightness warranty.
- C. Inspections shall be performed at each transition of roof detail encountered for each phase of roofing for the duration of the project. An experienced, full-time employee of the manufacturer, with experience in similar inspections over the past two years, must conduct each inspection.
- D. As part of the District's initiative to ensure field quality control, a **Simulated Rain Test** shall be conducted as follows:
 - 1. After completion of the four ply-membrane installation and prior to the installation of the cap sheet membrane, a water test shall be coordinated and conducted by the Contractor in the presence of the Design Professional and the Owner's representative. The Contractor shall give the Design Professional and the Owner's representative a minimum of 48 hours' notice prior to conducting the water test. The Design Professional shall be responsible for documenting the water test results.
 - 2. Prior to the water test, the Contractor shall ensure that the roof area(s) to be tested have been cleaned of debris and all roof drains are sufficiently plugged.
 - 3. The Contractor shall provide and/or arrange for all necessary equipment, supplies, water, etc. as needed to perform these tests. This may include a water truck with a fire hose, if necessary.
 - 4. At the direction of the Owner's Representative, apply simulated rain over all roof areas for at least 15 minutes per area, or as otherwise directed.
 - 5. In addition to the simulated rain test, direct water at all walls, windows, units, penetrations, etc. that occur adjacent to, or within each roof area, using a continuous, unforced hose stream.
 - 6. Plug all roof drains and scuppers in each drainage area and allow each drain/scupper sump to be filled to a depth of 3-4 inches. Allow water to stand for a minimum of 2 hours. The Contractor shall maintain photo documentation of the sump locations that the water level has maintained a constant level for

the time period required. These photos shall be provided to the Owner's Representative upon request.

7. Upon completion of the water test but before the end of each day, unplug drains/scuppers and ensure the water flows freely without restriction. There will be no overnight testing.
8. Perform any necessary corrections to defects noted (including the insuring of positive drainage around all curbs, roof openings, and crickets to roof drains or scuppers) during or after the water test. Additional testing shall be performed as necessary to further define sources of any noted leakage. All defects and/or corrections shall be made prior to the installation of the cap sheet membrane and the Owner's representative shall be informed when the corrections are complete.

1.07 WARRANTY

- A. **Manufacturer's Warranty:** Provide roofing manufacturer's total system leak-tight 20-year "No Dollar Limit Warranty," including insulation. Provide all details necessary to qualify for manufacturer's 20-year "No Dollar Limit Warranty."
- B. **Roofer's Guarantee:** Provide written guarantee from the Contractor stating that the Contractor will respond within twenty four (24) hours and repair within five (5) business days, any leaks or defects in the roofing assembly for four (4) years at no cost to the Owner.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Install roofing materials only when surfaces are clean, dry, smooth, and free of snow or ice.
- B. Do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application. Consult manufacturer's technical specifications on cold weather application.
- C. If during the course of the project, the rooftop mechanical equipment (heating and/or cooling) must be taken out of service to accomplish the work, the General Contractor shall provide temporary portable heating and/or cooling systems to maintain the building's interior environment equal to the building's own heating and/or cooling system.

PART 2- PRODUCTS

2.01 MANUFACTURER

- A. Provide a four ply felt with a one-ply mineral surfaced fiberglass cap sheet built-up roofing system. This is a minimum performance specification. Other manufacturer's systems may qualify, as determined by the design professional.

2.02 ROOF INSULATION PRODUCTS

- A. Perlite Board Roof Insulation: Rigid, noncombustible, perlite/fiber boards of thickness indicated and complying with ASTM C 728; manufacturer's standard sizes.
- B. Wood Fiber Roof Insulation: High density wood fiber board tested in accordance with ASTM C 208 where permitted by code and system requirements.
- C. Polyisocyanurate Foam Roof Insulation: Insulation shall be a close cell, polyisocyanurate foam core with factory-laminated facers conforming to ASTM specification C 1289-01, Type II, Class 1. Foam core shall have a rated flame spread of 25 or less according to ASTM E 84. Insulation shall have minimum compressive strength of 20 psi (Grade 2) according to ASTM C 1289-01. Insulation shall be supplied in 4'x4' boards for adhered applications and 4'x8' boards for mechanically attached applications.
- D. Perlite cant strip complying with ASTM C-728.
- E. Tapered edge strips, non-flammable perlite taper strips complying with ASTM C 209.
- F. Mechanical Fasteners: Provide fasteners and plates listed in the approved report as part of the total assembly proposed. Fasteners shall be installed in patterns as required for the specified rigid insulation by the manufacturer to produce the required wind uplift resistance.

2.03 ROOF SYSTEM

- A. Approved Manufacturers
 - 1. Johns Manville Roofing Systems Group, Specification 5GIC
 - 2. GAF Material Corporation, Specification I-O-5-M-/P6
- B. Roofing Felts
 - 1. Ply Sheets: Four plies of asphalt-impregnated glass fiber mat complying with ASTM D 2178, Type VI.

2. Felt Envelopes: Non-perforated, asphalt-saturated organic roof felt complying with ASTM D 226, Type I.
 3. Mineral surfaced fiberglass cap sheet complying with ASTM D 3909.
 - a. GlasKap by Johns Manville (GlasKap CR for LEED projects).
 - b. GAF Glas Mineral Cap Sheet by GAF (EnergyCap for LEED projects).
- C. Roofing Bitumens
1. Low fuming/low odor asphalt bitumen complying with ASTM D 312. Asphalt shall be domestically manufactured in the United States and as approved by the roofing system manufacturer.
 - a. Approved Products
 - i. Trulo Max by Owens Corning Trumbull
 - ii. No Smell Asphalt by Continental Materials
 - iii. No Smell Asphalt by United Asphalt
 - iv. Hot Stuff Asphalt's "Lite Packs"
 - b. Interply Moppings- Type III, IV
 - c. Glaze Coat- Type III
 - d. Flashings- Type III or IV, as recommend by manufacturer
 2. Contractor shall provide and maintain a fume recovery system acceptable to the Owner for the duration of the project to control fumes/odors associated with bitumen kettles.
- D. Flashings
1. Base Flashing Materials: Two plies of material base ply shall be SBS polymer modified bitumen reinforced with a polyester and/or glass fiber mat. (Top ply shall be the highly reflective fiberglass reinforced mineral cap sheet if LEED project).
 - a. Dynalastic 180S and Glaskap by Johns Manville Roofing Systems Group
 - b. Rubberoid Mop Smooth and GAF Glas Mineral Cap by GAF Material Corp.

2. Strip Flashing Materials: One ply of granule-surfaced SBS polymer modified bitumen sheet reinforced with a polyester and/or glass fiber mat:
 - a. Dynalastic 180S by Johns Manville Roofing Systems Group.
 - b. Ruberoid Mop Smooth by GAF Material Corporation.
- E. Walkways
 1. Granule-surfaced modified asphalt boards:
 - a. DynaTred by Johns Manville Roofing Systems Group
 - b. 2-layer SBS mopped together. Consult GAF Material Corporation
- F. Asphalt Roof Cement
 1. To comply with ASTM D 4586, asphalt roof cement (asbestos free) or roofing membrane manufacturer supplied SBS modified asphalt roof cement (asbestos free), as required.
- G. Related Materials
 1. Lead flashing for roof drains shall be 27"x27" and be a minimum four (4) pound lead.
 2. Pipe or vent jackets shall be a minimum three (3) pound lead with cap designed for use on flat roof construction.
 3. Perma-Flash is an acceptable alternative to lead pipe jackets. Perma-Flash system requires 1 coat of TopGuard Base Coat and 2 coats of TopGuard 4000 to final product.
 4. MajorSeal Liquid Flashing by GAF Material Corporation.
 5. Wood nailers: Shall be FRTW only on any roofing surfaces.
 6. Flashing securement devices shall be of adequate design to achieve substantial completion and positive drainage.
 - a. Anchor bars for flashing securement to concrete or masonry substrates shall be 1/8" x 1" flat aluminum bar with 8" hole spacing by OMG, or approved equal.

PART 3- EXECUTION

3.01 INSPECTION

- A. The Contractor shall be responsible for suitable substrate to accept the roofing system.
- B. Installer of roofing system shall examine substrate and conditions under which roofing work is to be performed and shall notify the Architect and Owner representative immediately of unsatisfactory conditions. Do not proceed with roofing work until unsatisfactory conditions have been corrected in manner acceptable to installer and manufacturer.
- C. Before roofing work may begin, the design professional shall conduct a pre-roofing coordination meeting. It shall be attended by the Owner's representative, PSFA representative (as required), the General Contractor, the roofing contractor, the roofing manufacturer's rep, (local sales rep is acceptable), and all other subcontractors who have any components of their work on or penetrating the roof. The participants shall:
 - 1. Examine roof deck to determine that it is sufficiently rigid to support roofers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.
 - 2. Verify roof deck is clean and smooth, free of depressions, waves, or projections, properly sloped to insure drainage. Examine substrate to determine that surface is in a suitable condition for roofing work.
 - 3. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and cant strips, wood nailing strips, and reglets are in place. Verify that all curbs and penetrations have been laid out and installed with adequate vertical and horizontal clearance as required by the manufacturer to provide the specified warranty.
 - 4. The condition of the surface to receive roof insulation shall be firm, clean, smooth, and dry. Do not start roof application until defects have been corrected.
- D. As much as possible by visual inspection and by the cutting of core samples, verify that surfaces and site conditions are ready to receive work.

3.02 INSTALLATION

- A. General: Comply with manufacturer's written instruction for installation of the roof system.

- B. All flashings shall be installed concurrently with the roofing membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative. If any water is allowed to enter under the newly completed or existing roofing due to incomplete flashings, seams and or night seals, the affected area shall be removed and replaced at the Applicator's expense.
- C. Phased Construction & Completion Requirements:
 - 1. Phased construction will not be permitted on this project. However, if, due to a foreseeable weather event, phased construction is required, the Contractor shall request (in writing) the approval of phased construction from the Design Professional, roofing manufacturer, and the Owner's Representative.

3.03 WOOD NAILER LOCATION AND INSTALLATION

- A. Nailers are to be installed as per detail drawings.
- B. Discard units of material with defects that might impair quality of work and units that are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- C. Set nailers to required levels and lines with members plumb and true.
- D. All perimeter nailers shall be of uniform height within a given roof section.
- E. Nailers shall be installed with $\frac{1}{4}$ " gap between ends of adjoining pieces.
- F. Nailers shall be fastened in accordance with the following schedule:
 - 1. Fasteners in 6" or wider (nominal) lumber shall be installed in two (2) rows, staggered one-third of nailer width. Listed spacings indicate distance between fasteners in adjacent rows.
 - 2. Two (2) fasteners shall be installed within 6" of each nailer end.
 - 3. Corner fastener spacing shall extend 8' from all outside building corners.
 - 4. Where two or more nailers are installed, each nailer shall be fastened independently.
 - 5. Over all deck types, the bottom nailer shall be fastened using the specified fasteners and $\frac{5}{8}$ " washers. Countersink washers and fasteners level with top of wood using spade bit or similar method. Fasten subsequent nailers, where specified, using the specified screws without washers.

6. When nailers are stacked, stagger the layer ends no less than 24”.
7. Nailer Attachment Schedule (unless noted otherwise on the drawings):

Attachment Substrate	Perimeter Fastener Spacing (max)	Corner Fastener Spacing (max)
Structural Concrete	12” o.c.	6” o.c.
CMU (fastener into solid material)	12” o.c.	6” o.c.
Steel Deck	12” o.c.	6” o.c.
Wood	12” o.c.	6” o.c.

3.04 INSULATION INSTALLATION

- A. Installing Insulation: Install only as much insulation as can be covered with the roofing membrane and completed before the end of the day's work or before the onset of inclement weather.
 - i.
 - ii.
- B. Fit Insulation: Neatly fit insulation to all penetrations, projections, and nailers. Insulation should be loosely fitted, with gaps greater than one quarter inch (1/4") being filled with acceptable insulation. Under no circumstances should the membrane be left unsupported over a space greater than one quarter inch (1/4"). Tapered or feathered insulation should be installed around roof drains so as to provide proper slope for drainage.
- C. Two-Layer Installation: Where overall insulation thickness is two (2) inches or greater, install required thickness in two layers with joints of second layer staggered from joints of the first layer a minimum of twelve (12) inches each direction.
- D. Attach Insulation: Insulation must be attached using Fasteners and Insulation Plates. Refer to the Technical Information for attachment patterns and rates for specific insulation types and thickness. In a multi-layer insulation assembly, the type and thickness of the top layer of insulation determine fastening pattern. Insulation fasteners shall penetrate the top of the flutes and shall not extend into the building

interior. Roofing contractor is liable for replacing fasteners that extend beyond the bottom of the flutes.

- E. Stagger Insulation Joints: When installing multiple layers of insulation, all joints between layers should be staggered.

3.05 MEMBRANE FLASHING INSTALLATION

- A. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with equiviscous temperature method ("EVT Method") as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 25°F at point of application) more than one hour prior to time of application. Discard bitumen that has been held at temperature, exceeding finished blowing temperature (FBT) for a period exceeding 3 hours.
- B. Contractor shall provide and maintain a fume recovery system acceptable to the Owner for the duration of the project to control fumes/odors associated with bitumen kettles.
- C. Quality Control: Contractor's asphalt kettle shall be equipped with an accurate built-in thermometer. Contractor shall also have available at the site and additional portable thermometer for checking temperature of asphalt at the point of application and for use as a check on the kettle thermometer.
- D. Bitumen Mopping Weights: For interply mopping, and for other mappings except as otherwise indicated, apply bitumen at the rate of 25 pounds of asphalt (plus or minus 25 percent on a total-job average basis) per roof square (100 sq. ft.) between plies.
- E. Substrate Joint Penetrations: Do not allow bitumen to penetrate substrate joints and enter building or damage insulation, vapor retarders, or other construction. Where mopping is applied directly to a substrate, tape joints or, in the case of steep asphalt, hold mopping back 2 inches from both sides of each joint.
- F. Cutoffs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of 2 plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work. Glaze-coat areas of completed organic ply sheets before end of each day's work.
- G. Roofing Membrane Installation: Apply a piece 9" wide, then over that, one 18" wide, then over that, one 27" wide. Over these 3 partial sheets install a full width 36" piece. The following felts are to be applied full width, overlapping the preceding felts by 27-1/2" so that at least 4 plies of felt cover the substrate at all locations. Install each felt so that it is firmly and uniformly set, without voids, into the hot bitumen (within $\pm 25^\circ\text{F}$ of the EVT) applied just before the felt at a nominal rate of 23 lbs. per square, over the entire surface. Installation over porous substrates such as roof insulation may require up to 33 lbs. of hot bitumen per square.

- H. Surfacing: Prior to application of the fiberglass reinforced mineral surfaced cap sheet, cut the cap sheet into handleable lengths (12' - 18'). Lay the material out on the roof and allow it to relax and flatten. To accommodate a full width sheet, apply a mopping of hot asphalt, approximately 20°F above the EVT, at a nominal rate of 25 lbs. per square. (The higher temperature of asphalt maximizes the bonding of the cap sheet to the ply felts.) Then flop the cap sheet into the hot asphalt. On subsequent courses, the cap sheet is positioned upside down, directly over the sheet in the preceding course such that the side lap area of the preceding sheet is exposed. Care should be taken to maintain 2" side laps and 6" end laps.
- i. Asphalt is applied in the same manner as before, making sure to also cover the 2" exposed side lap. Asphalt may also be applied to the exposed "upside down" cap sheet, prior to "flopping" it into the hot asphalt. The cap sheet must be firmly and uniformly set, without voids, into the hot asphalt with all edges and laps well sealed.
- l. Care shall be taken not to track bitumen onto the finished exposed membrane. Full adhesion shall be achieved and all edges shall be well sealed. Leading and trailing edges of T-laps in both plies shall be hand rolled to prevent formation of voids. Asphalt shall bleed out one quarter inch (1/4") to one half inch (1/2") at laps. #11 color match granules shall be broadcast into asphalt bleed out while hot so that the finished appearance is uniform and neat.
- J. Set-On Accessories: Where small roof accessories are set on built-up roofing membrane, set metal flanges in a bed of roofing cement and seal penetration of membrane with bead of roofing cement to prevent flow of bitumen from membrane.
- K. Composition Flashing and Stripping: Install composition flashing at cant strips and other sloping and vertical surfaces, at roof edges and at penetrations through roof.
- L. Application of Base Flashing: The roofing membrane must extend to the top of the cant. The completed base flashing shall extend not less than 8" or more than 24" above the level of the roof, and shall extend onto the roof membrane a minimum of 4".
 - 1. Starting just below the point on the parapet where the base flashing will terminate, mop the parapet and the surface on the roofing felts on the cant with hot Type III or Type IV asphalt. Immediately place the backer felt into the hot bitumen, smoothing the felt to set it firmly into the bitumen. The bottom edge of the backer felt should terminate at the bottom edge (base) of the cant. Do not extend the backer felt onto the horizontal membrane surface. Laps in the backer felt should be a minimum of 2".
 - 2. All flashings shall be installed in 39" long pieces, cut from the end of the roll. Starting just above the top edge of the backer felt, mop the wall, the surface of the backer felt and out onto the roof membrane with hot Type III or IV asphalt. Holding the upper corners of the flashing, position "its lower

horizontal edge on the roof membrane (minimum 4" from base of the cant) and lay it into place over the cant strip and up the wall. The sheet should be "worked-in" to ensure that it is firmly and uniformly bonded. In cool or cold weather, the back of the flashing sheet should also be mopped with the hot bitumen, and shorter lengths of flashing should be used. Laps in the flashing should be minimum of 3" and be well sealed.

3. Mechanically fasten the base flashing on 6" centers along its top edge. Fasteners must have a 1" minimum diameter integral cap, or be driven through 1" minimum diameter rigid metal discs.
 4. All inside and outside corners and vertical laps shall be three-coursed with asphalt roof cement and reinforcing fabric, with #11 color matched granules broadcast and pressed into the cement while wet.
- M. Roof Drains: Fill clamping ring base with a heavy coating of roofing cement. Extend built-up roofing membrane into clamping ring or, where not feasible, provide two-plies of glass-fiber-reinforced flashing mopped with Type III asphalt and extended into clamping ring. Extend flashings onto built-up asphalt roofing system 6 inches and 10 inches, respectively. Before pacing clamping ring, set 2 plies of glass-fiber fabric in roofing cement and coat with roofing cement. Extend each fabric into clamping ring and for distances of 14 inches and 16 inches, respectively, onto built-up roofing.
- N. Installation of Roof Accessories: Miscellaneous sheet metal accessory items, including insulation vents and other devices, and major items of roof accessories (if any) to be coordinated with built-up roofing system work, are specified in other sections of these specifications.

3.06 PROTECTION

- A. Protect building surfaces against damage from roofing work. Where traffic must continue over finished roof membrane, protect surfaces.

3.07 TEMPORARY CLOSURE

- A. Temporary closures to ensure that moisture does not damage any completed section the new roofing system are the responsibility of the roofing contractor. Completion of flashing, terminations, and temporary closures should be complete as required to provide a watertight condition. Any material contaminated by a temporary closure must be cut out and discarded prior to resumption of installation.

3.08 CLEANUP

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by work of this Section, consult manufacturer of surfaces for cleaning advice and conform to their instructions.
- C. Remove excess materials, trash, debris, equipment, and parts from the Work.
- D. Repair or replace defaced or disfigured finishes caused by work of this Section.

END SECTION

1 SECTION 07 9200 - JOINT SEALANTS

2
3 Certification: Provide Contract Conformance certification for products, assemblies, accessories and
4 installation.

5
6 PART 1 - GENERAL:

7
8 Preconstruction Joint Sealer-Substrate Tests: Submit substrate materials representative of actual joint
9 surfaces to joint sealer manufacturer for laboratory testing of joint sealers for adhesion to primed and
10 unprimed substrates and for compatibility with joint substrates and other joint-related materials.

11
12 Related Sections:

13 Section 01 8113 – Sustainable Design Requirements (LEED Projects)

14
15 Submittals: In addition to product data submit the following:

16
17 Samples of each type and color of joint sealer required.

18
19 Certified test reports for joint sealers evidencing compliance with requirements.

20
21 LEED Submittal Requirements: Provide the following on LEED certified projects:

22
23 Certification that products in this section will comply with VOC requirements in Division 1 LEED
24 Requirements.

25
26 Scope:

27
28 Provide joint sealers where shown on Drawings, and on building exterior at all joints between
29 dissimilar materials, in all masonry expansion joints, and all joints between exterior metal panels,
30 whether or not called out on Drawings.

31
32 Provide sealant joints in concrete flatwork.

33
34 At building interior, provide silicone sealant around all plumbing fixtures.

35
36 Provide latex caulk in all open joints and cracks in interior construction and then paint to match
37 adjacent surfaces.

38
39 PART 2 - PRODUCTS:

40
41 Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one
42 another and with joint substrates under service and application conditions, as demonstrated by testing
43 and field experience.

44
45 Colors: Provide color of exposed joint sealers indicated, or if not otherwise indicated, as selected by
46 Architect from manufacturer's standard colors.

47
48 Multi-Part Nonsag Urethane Sealant use for vertical joints on building exterior:

1
2 "Sonolastic NP 2"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
3 Available in 300 stock colors at no additional cost.

4
5 Multi-Part Nonsag Urethane Sealant use for horizontal traffic joints on exterior work:

6
7 "Sonalastic SL 2", by Sonneborn Building Products Div.
8 "Sikaflex-2C NS"; Sika Corp.
9 "THC-901"; Tremco Inc.

10
11 Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag, acrylic, mildew-resistant, paintable,
12 acrylic-emulsion sealant complying with ASTM C 834, use with interior paint work.

13
14 Silicone-Emulsion Sealant: Manufacturer's standard one part, nonsag, mildew-resistant, paintable,
15 silicone-emulsion sealant complying with ASTM C 834, use for sealing interior joints with nonporous
16 substrates and subject to in-service exposure to conditions of high humidity and temperature. Typical at
17 all plumbing fixtures.

18
19 Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning,
20 nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to
21 reduce transmission of airborne sound.

22
23 Sealant Backings, General: Nonstaining; compatible with joint substrates, sealants, primers and other
24 joint fillers; approved for applications indicated by sealant manufacturer based on field experience and
25 laboratory testing.

26
27 Plastic Foam Joint-Fillers: Preformed, compressible, resilient, nonwaxing, nonextruding strips of
28 plastic foam of material indicated below, and of size, shape and density to control sealant depth
29 and otherwise contribute to producing optimum sealant performance.

30
31 Open-cell polyurethane foam, flexible.

32
33 Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant
34 manufacturer for preventing bond between sealant and joint filler or other materials at back of
35 joint.

36
37 Primer: As recommended by joint sealer manufacturer where required for adhesion of sealant to joint
38 substrates indicated.

39
40 Accessory Materials for Fire-Stopping Sealants: Forming, joint-fillers, packing and other accessory
41 materials as required for installation of fire-stopping sealants.

42
43 EXECUTION:

44
45 General: Comply with joint sealer manufacturer's instructions applicable to products and applications
46 indicated.

47
48 Elastomeric Sealant Installation Standard: Comply with ASTM C 962.

1910

- 1
- 2 Latex Sealant Installation Standard: Comply with ASTM C 790.
- 3
- 4 Acoustical Sealant Application Standard: Comply with ASTM C 919 for use of joint sealants in acoustical
- 5 applications.
- 6
- 7 END OF SECTION 07 9200

1 SECTION 07 7100 - ROOF SPECIALTIES AND ACCESSORIES

2
3 Related Sections:

4 Section 01 8113 – Sustainable Design Requirements (LEED Projects)

5
6 Standards: Comply with SMACNA "Architectural Sheet Metal Manual" details for fabrication of units,
7 including flanges and cap-flashing to coordinate with type of roofing indicated. Comply with "NRCA
8 Roofing and Waterproofing Manual" details for installation of units.

9
10 Roof Insulation Vents: 4" aluminum vent stack 12" high with 4" outstanding roof flange, and with 6"
11 diameter x 3" high cap.

12
13 Bellows-Type Expansion Joint Covers:

14
15 Roof to Roof: Style CF

16 Roof to Wall: Style CF-EJ

17 Curb to Wall: Style EJ-WC

18 Products by Manville Roofing Systems Dimensions as required to span widths shown.

19
20 Pipe and Conduit Supports:

21
22 Provide pipe supports by "Advanced Support Products" or "Cooper B-Line, C-Ports". Provide submittals
23 indicating proposed application.

24
25 Ships Ladders:

26 Provide Royalite Model SLRH-75 aluminum ship's ladder.

27
28 Hatch Access Ladders:

29 Provide Royalite Model HL Sure Step hatch access ladder.

30
31 Roof Hatches:

32 Provide Bilco Single Leaf Roof Scuttle, Type NB, Size 2'-6" x 3'-0" minimum.

33
34 Crossovers:

35 Provide PHP Systems/Design Crossover, galvanized finish with stairs at both sides of landing platform and
36 injection molded bases.

37
38 Installation:

39
40 Seal waterproof expansion joints between roof accessory units with concealed pockets of mastic sealant.

41
42 Anchor units securely to supporting structure, except for small accessory items which are bedded and
43 stripped into roofing for support.

44
45 Coordinate installation with deck construction, vapor barrier (if any), insulation, roofing and flashing work,
46 to provide waterproof and weatherproof installations, in accordance with Construction Details of NRCA
47 Roofing and Waterproofing Manual.

1910

- 1 Separate dissimilar metals by coating surfaces with bituminous coating or other permanent separation.
- 2
- 3 END OF SECTION 07 7100

1 SECTION 07 8400 - FIRESTOPPING

2
3 PART 1 - GENERAL

4
5 RELATED DOCUMENTS;

6
7 Drawings and general provisions of Contract, including General and Supplementary Conditions and
8 Division 1 Specification sections, apply to work of this section.

9
10 Section 01 8113 – Sustainable Design Requirements (LEED Projects)

11
12 DESCRIPTION OF WORK;

13
14 Provide firestopping and firesafing for all new and existing ducts, piping, cable trays, conduits, voids, etc.
15 which penetrate or violate fire rated and smoke division floors, walls, etc.

16
17 The Work of this Section is indicated on the Drawings, specified herein, and as required to comply with
18 the Code Provisions for Life Safety.

19
20 When fire resistive assemblies encounter other building elements the fire resistive boundary shall be
21 maintained to its full required extent. The Contractor shall make adaptations (i.e. offsets, penetrations,
22 enclosures, etc.) to the fire resistive assemblies as directed by the architect and the Building Official at
23 no additional cost to the Owner.

24
25 QUALITY ASSURANCE;

26
27 The Work of this Section shall comply with the following codes and standards including all current
28 editions, revisions and supplements.

29
30 Fire Tests of Building Construction and Materials: ASTM E119

31
32 Test for Non Combustibility of Elementary Materials: ASTM E136

33
34 Fire Tests of Through-Penetration Fire Stops: ASTM E814

35
36 Fire Tests of Through-Penetration Fire Stops: UL 1479

37
38 Life Safety Code: NFPA 101

39
40 National Electrical Code: NFPA 70

41
42 SUBMITTALS

43
44 Certification: Provide contract conformance certification for all products, assemblies and installation.

45
46 Installers: Provide submittal showing installers qualifications.

1 Product Data: Submit manufacturer's printed material specifications and application instructions for
2 each type firestopping specified.

3
4 Fire-Rate Assembly: Submit specific U.L., Inc. design, application and material to be used for
5 firestopping as applicable to each type condition (floors, walls, ceiling , pipe/conduit penetrations, etc.);
6 more than one (1) specific material may have to be used to meet the requirements of each type
7 penetration to be protected.

8
9 LEED Submittal Requirements:

10
11 Provide the following on LEED certified projects:

12
13 Certification that products in this section will comply with VOC requirements in Division 1 LEED
14 Requirements.

15
16 DELIVERY, STORAGE AND HANDLING

17
18 Deliver materials to job site in a timely manner to ensure uninterrupted progress. Materials shall be in
19 unopened containers or packages bearing manufacturers' names, brand designations, product
20 descriptions and expiration dates.

21
22 PART 2 - PRODUCTS

23
24 MATERIALS

25
26 SAFING INSULATION

27
28 Description: F.S. HH-I-521F with waiver of identification - marking requirement: Curtain Wall Insulation
29 as Type I and III, Safing Insulation as Type I, Mineral Fireproofing as type I; F.S. HH-I-558B Curtain Wall
30 Insulation as Class 1 and 2, also as Class 3 and 4 for CW 70 and CW 90, Safing Insulation as Class 1 and
31 2, Mineral Fireproofing as Class 1, 2, 3 and 4. Flamespread: 15, Smoke Developed: 0. No melting or
32 disintegration after five (5) hours at 2080 degrees F. Material Density: 4 pcf. Size and thickness as per
33 U.L. Inc. design requirements.

34
35 Safing Impaling Clip: 20 gauge galvanized steel, one inch wide, brake to "Z" configuration. Legs shall be
36 two (2) inches long then broken 90 degrees with three (3) inch leg, then broken 90 degrees and parallel
37 to first leg three (3) inches long, this last leg shall be cut 45 degrees at end forming and impaling point.
38 Install at 24" on centers maximum.

39
40 Product/Manufacturer: "Thermafiber", manufactured by United States Gypsum Company, Chicago,
41 Illinois 60606.

42
43 FIRESTOPPING

44
45 Description: Firestopping shall comply with and ASTM E84, ASTM E814. Sealants, caulking, or putties
46 specifically designed as fire-stopping materials to totally seal voids where ducts, piping, cable trays,
47 conduits, etc. penetrate fire-rated floors, walls, etc., use one of the following firestopping materials to

1 provide the hourly fire-rated assemblies required in accordance with the Underwriters Laboratories,
2 Inc. design appropriate for the specific material and application intended to be used.

3 4 Manufacturers

5
6 "Dow-Corning 2001 FIRESTOP FOAM", manufactured by Dow- Corning Corporation, Midland,
7 Michigan 48640.

8
9 "Dow-Corning 2000 FIRESTOP SEALANT", manufactured by Dow- Corning Corporation,
10 Midland, Michigan 48640.

11
12 "Flameseal Fire-Stop Putty", manufactured by Nelson Electric, Tulsa, Oklahoma 74101.

13
14 "CP25 Fire Barrier Caulk", manufactured by Electro-Products Division/3M, St. Paul,
15 Minnesota 55144.

16
17 3M-303 Fire Barrier Putty", manufactured by Electro Products Division/3M, St. Paul,
18 Minnesota 55144.

19
20 "Acoustical and Insulation Sealant", manufactured by Pecora Corporation, Harleysville,
21 Pennsylvania 19438.

22
23 "Sealbags, KBS Fire Protection Systems", manufactured by International Protective Coatings,
24 Inc., Oakhurst NJ, 1-800-334-8796

25 26 PART 3 - EXECUTION

27 28 PREPARATION

29
30 Clean surfaces to be in contact with firestopping materials of dirt, grease, oil, loose materials, or other
31 substances that may affect proper installation and the required fire resistance assembly.

32 33 INSTALLATION

34
35 Safing Insulation: Install safing insulation where indicated and at building expansion joints and at
36 intersections of walls/partitions. Safing shall be sized for the full thickness of wall/partition, etc. Where
37 safing is used at storefront systems or similar vertical/horizontal plane intersections use safing clips to
38 support safing. Space clips maximum 24 inches on center. In all applications, compress and install
39 safing in opening and voids to seal voids solid providing complete and positive firestopping.

40
41 Firestopping Foam: Follow manufacturer's installation instructions. Install damming materials and
42 sealant to cover and seal penetration openings. Inject foam mixture into openings in accordance with
43 installation instructions, continue to inject mixture continuously into opening until filled but do not
44 exceed measured snap time or maximum of three (3) minutes, whichever is less. If opening is not filled
45 when shot reaches snap time or maximum of three (3) minutes, stop application for fifteen (15)
46 minutes minimum. Repeat injection and cure procedure until opening is filled. Cure each shot
47 minimum fifteen (15) minutes before beginning next shot. Cure foam for twenty-four (24) hours
48 minimum.

1
2
3
4
5
6
7
8
9
10
11
12
13
14

Puttys, Caulks, Sealants and Bags: Follow manufacturer's installation instructions for specific U.L. Inc. assembly. Provide cabling bags at penetrations of cable trays.

INSPECTION:

Examination: Contractor shall examine firestopped areas to ensure proper installation. Do not proceed with concealing, covering-up or enclosing firestopped areas until Building Official inspects and approves.

Accessibility: Areas of firestopping work shall remain accessible until inspection and approval by applicable code authorities or Owner.

END OF SECTION 07 8400.

1 SECTION 02 4100 - DEMOLITION

2
3 PART 1 - GENERAL

4
5 RELATED DOCUMENTS:

6 Section 01 8113 – Sustainable Design Requirements (LEED Projects)

7
8 SCOPE OF WORK:

9
10 Demolition and Removals:

11
12 General: All debris from demolition operations shall be disposed of to a legal dump. Demolition and
13 removal work is indicated on the Drawings and as specified herein.

14
15 Existing Building: Demolition, disassembly and removal includes, but is not necessarily limited to the
16 following:

17
18 Removal of existing roofing, roof insulation, flashings, etc., as indicated in the drawings and as
19 required to perform the Work.

20
21 Removal of suspended lay-in and gypsum board ceilings including suspension grid systems.

22
23 Removal of all abandoned plumbing piping, electrical raceways and ductwork not shown for reuse
24 on the Drawings.

25
26 Cutting and patching of walls, ceilings, floor slabs, etc. to accommodate modifications to
27 electrical, plumbing, and mechanical systems, and any other work required as part of this project.

28
29 Demolition, disassembly and removal work is indicated on the Drawings and as specified herein.

30
31 Patching: Patching floors, walls, ceilings and fireproofing assemblies to match surrounding work is
32 included in the scope of remodeling work. The patch work shall exactly match the adjacent work in every
33 way – color, texture, sheen.

34
35 Floor Leveling: Leveling of floors is included in the scope of remodeling work. Provide leveling of low
36 spots revealed by demolition of existing floors. The Scope of Work does not include leveling of entire
37 rooms.

38
39 Salvage: Owner shall have first right of refusal for all salvage equipment and materials. Any item removed
40 from the existing building as part of this Work may be identified as salvage. Items identified for salvage
41 shall be designated by Owner's representative and transported to storage location not more than five
42 miles away by Contractor. Salvage includes boulders indicated on Site Plans. All other salvage items
43 desirable by the Owner will be removed by the Owner before construction.

44
45 QUALITY ASSURANCE:

46
47 Codes and Standards: The Work of this Section shall comply with the following codes and standards
48 including all current editions, revisions and supplements.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48

New Mexico Commercial Building Code
International Code Council – International Building Code

OSHA - 29CFR Part 1926, Occupational Health and Safety Standards for the Construction Industry, with Amendments.

NFPA 241, Building Construction and Demolition Operations.

New Mexico Department of Public Health, Licensing Regulations, Part 2.

Requirements for Structural Work: Before cutting and patching the following categories of work, obtain Architect’s approval.

Structural steel.

Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories of work.

Bearing and retaining walls.

Operational and Safety Limitations:

Before cutting and patching the following elements of work, and similar work elements, obtain Architect’s approval:

Primary operational systems and equipment.

Water/moisture/vapor/air/smoke barriers, membranes and flashings.

Noise and vibration control elements and systems.

Piping, ductwork, vessels and equipment control, communication, conveying, and electrical wiring systems.

Weathertightness: The building shall remain absolutely weathertight throughout all work. The Contractors shall use all means necessary to maintain a totally weathertight, dry building.

Coordination:

All trades and subcontractors shall coordinate their work, checking with one another before commencing with work to be sure of limits or required work.

The Contractor (General Contractor) shall be ultimately responsible for all coordination.

Contractor shall coordinate all work to ensure shortest possible demolition time in existing building. No work shall be started until all material, products and equipment are on hand and all trades ready for a total combined coordinated effort.

1
2 All equipment of Owner shall be thoroughly protected from water, dust, dirt, paint debris, etc., at all times.

3
4 HAZARDOUS MATERIAL: All hazardous materials and materials/finishes laden with hazardous materials
5 shall be removed and disposed of in accordance with Federal Statutes which apply to the following types
6 of hazardous material.

7
8 Asbestos containing material.

9
10 PCBs (Polychlorinated Biphenyls).

11
12 Others.

13
14 GENERAL

15
16 Visual Requirements:

17
18 Patchwork, on the building exterior or in its occupied spaces, shall not lessen the building's
19 aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual
20 evidence of cut and patch work. Remove and replace work judged by the Architect to be cut and
21 patched in a visually unsatisfactory manner.

22
23 Only experienced and specialized tradesmen shall cut and patch the following categories of
24 exposed work:

25
26 HVAC enclosures, cabinets or covers.

27
28 Concrete.

29
30 Structural Steel.

31
32 SUBMITTALS

33
34 Methods: Submit schedule indicating proposed methods and sequence of operations for selective
35 demolition work to Architect for review prior to commencement of work. Include coordination for shut-
36 off, capping, and continuation of utility services as required, together with details for dust and noise
37 control protection.

38
39 Sequencing: Provide detailed sequence of demolition and removal work to ensure uninterrupted progress
40 of Owner's on-site operations.

41
42 DRAWINGS

43
44 The Drawings indicate in general, items of material and equipment which must be removed, revised,
45 reworked or otherwise modified. No attempt has been made to indicate each and every portion of
46 demolition and remodeling work. Rather, the intent of the Drawings is to provide a guide to the
47 contractors to better enable them to anticipate the entire scope of work.
48

1 Likewise no attempt has been made to indicate each and every bit of patching, whether ceiling systems,
2 concrete, plaster, painting, etc. Again the intent of the Drawings and these specifications is to provide a
3 guide to the contractors to better enable them to anticipate the entire scope of the work.
4

5 JOB CONDITIONS

6
7 Occupancy: The Owner will be continuously occupying areas of the building immediately adjacent to areas
8 of selective demolition. Conduct selective demolition work in manner that will minimize need for
9 disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Architect of
10 demolition activities which will severely impact facility's normal operations, including interruption of
11 utility services.
12

13 Condition of Structures: Architect assumes no responsibility for actual condition of items or structures to
14 be demolished.
15

16 Salvaged Materials: Contractor shall salvage the previously listed materials for reuse or to Owner, as
17 directed. Salvaged materials shall be cleaned, sorted, identified, bundled, boxed, etc., and either reused
18 or delivered to a collection location as designated by the Owner.
19

20 Thoroughly clean salvaged items and restore to new condition. Reuse to greatest extent possible.
21

22 Items not scheduled for reuse or for salvage to Owner shall become property of the Contractor
23 and shall be removed from site promptly.
24

25 Maintenance of Services:

26
27 Maintain all existing mechanical and electrical services in operation until new systems are
28 operational and ready to replace them as required.
29

30 Contractor shall maintain all mechanical, electrical, plumbing, irrigation, security and
31 communications services during construction when the building is occupied by the Owner. Notify
32 Owner within 48 hours of any shutdowns. Provide all bypasses, cross-connects and/or temporary
33 routings and connections as required to insure full operation of services to all surrounding areas
34 that are not part of the Work at no additional cost to the Owner.
35

36 Outage periods during cutovers to new systems shall be kept as short as possible.
37

38 Coordinate electrical and mechanical work with that of architectural trades so that all are
39 accomplished simultaneously.
40

41 Schedule all utility outages and cutovers with the Owner in advance. Means of transfer and
42 shut-off periods to be approved in advance.
43

44 Electrical and mechanical work shall be coordinated and accomplished at same time as that scheduled for
45 Architectural Trades Work. Owner shall be notified in advance of any shut-off periods.
46

47 Any damage created to existing building by operations of contractors under this contract shall be repaired
48 to original condition at Contractor's expense. Extreme caution shall be exercised to prevent damage to

1 existing areas not scheduled to be remodeled.

2
3 Maintenance, operation, and control of all new or temporary (where approved by Architect) electrical or
4 mechanical facilities put into operation before final acceptance of project will be complete responsibility
5 of Contractor until final acceptance.

6
7 Traffic: Access must be maintained to exits at all times for all personnel, public, etc.

8
9 Conduct selective demolition operations and debris removal in a manner to ensure minimum
10 interference with roads, streets, walks, and other adjacent occupied or used facilities.

11
12 Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without
13 written permission from authorities having jurisdiction. Provide alternate routes around closed
14 or obstructed traffic ways if required by governing regulations.

15
16 Contractor access into building for demolition and remodel work shall be through exits as
17 designated by the Owner.

18
19 All equipment of Owner shall be thoroughly protected from water, dust, dirt, paint, debris, etc., at all
20 times.

21
22 Explosives: Use of explosives shall not be permitted.

23
24 Noise and Vibration:

25
26 Contractor shall schedule any operations creating noise or vibration in advance with the Owner.

27
28 Environmental Controls:

29
30 Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt
31 rising and scattering in air to lowest practical level. Comply with governing regulations pertaining
32 to environmental protection.

33
34 Do not use water when it may create hazardous or objectionable conditions such as ice, flooding,
35 and pollution.

36
37 Burning of removed materials is not permitted.

38
39 PART 2 - PRODUCTS

40
41 MATERIALS

42
43 General: Except as otherwise indicated, or as directed by the Architect, use materials for patching that
44 are identical to existing materials. If identical materials are not available, or cannot be used, use materials
45 that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use
46 materials for cutting and patching that will result in equal-or-better performance characteristics.

47
48 Dustproof Partitions: Erected by Contractor to separate construction areas from all adjacent work areas:

Dust must be limited and controlled to area in which work is being done:

Construct partitions as described herein. Materials for partitions shall not be reused from one area to the next, and before any partitions are removed from a location, both sides must be vacuum cleaned in approved manner.

Extra materials for dustproof partitions shall be stored on jobsite at all times to construct additional partitions that might be required in case of emergency or as might be required by Architect.

Non-Combustible Materials:

All framing members of partitions (studs, tracks, plates, etc.) shall be non-combustible, fire resistant composition.

Surfacing materials for use over framing members of dust-proof partitions shall be non-combustible composition unless noted on the Drawings or otherwise approved by Architect.

Drop cloths or other materials used for temporary covering or protection of Owner equipment or existing surfaces in building shall be as specified in paragraph below.

Drop Cloth and Partition Membrane:

Drop cloth and partition membrane shall be three (3) ply low density copolymer having a tear strength of 130 pounds; water vapor permeability of 1.5 as determined by ASTM E96. Membrane shall be semi-transparent plastic approximately six (6) mil thickness reinforced with non-woven nylon cord forming an approximate 1/2" x 1/2" diamond pattern through membrane.

Each package and roll of membrane shall be fire-retardant type and shall be marked with Underwriter's Laboratories, Inc., Fire Hazard Classification designating the following:

Flame Spread:	10	
Fuel Contributed:		Not determinable
Smoke Developed:	45	

Membrane Identification: Type 55, Fire-Retardant.

Adhesive Tape: All joints, laps penetrations, tears, etc., shall be sealed tight to inhibit migration of dust, debris, water vapor, etc., and shall be compatible with membrane. Tape width: two (2) inches wide minimum.

Manufacturer: Griffolyn Company, Division of Reef Industries, Houston, Texas 77233, Telephone: 1-800-231-6074, or acceptable substitution.

Concrete:

Portland Cement: ASTM C150, Types I or II or low alkali. Use only one brand throughout the

product. Do not change brand without prior approval.

Aggregates: ASTM C33, from approved pits free of vegetable matter, opaline, chert, felspar, and siliceous magnesium substances. Furnish clean, hard, finegrained sound crushed rock or washed gravel coarse aggregate not containing over 5% by weight or flat, chiplike, thin, elongated, friable or laminated pieces (pieces having major dimension over 5 times average dimension) or over 2% by weight of shale certy material.

Water: Clean, fresh, free from oil, acid, organic matter or other deleterious substances, potable.

Concrete Patching Compound:

Description: Fast setting non-shrink patching material used for repairing/patching honeycomb, spalls, cracks, holes left by toe wires or spreaders and construction faults in concrete.

Technical Characteristics:

<u>Test</u>	<u>Method</u>	<u>Performance Results (Minimum)</u>
Compression	ASTM C190	4200 psi in 1 hour

Product/Manufacturer: "ARDEX SD-P", manufactured by ARDEX, Inc. Aliquippa, PA 15001

Floor Leveling Materials:

Description: Self-leveling cement based compound, compressive strength: 263 psi at one (1) day, 4100 psi at 28 days in accordance with ASTM C349.

Hardness: 10,400 psi at 28 days in accordance with ASTM E10/Brine II. Use where concrete slabs are not level, at rough concrete and rained-on concrete, for rehabilitation existing floor slabs in general. Use to achieve absolutely level floor slabs in general.

Product/Manufacturer:

"ARDEX K-15 Cement-Based Self-Leveling Underlayment", manufactured by ARDEX, Inc. Aliquippa, PA 15001

Other Materials: All other materials not specifically described in each individual Section of the Specifications but required for a complete and proper installation of the Work of that Section or Sections shall be new, first quality of their respective kinds, selected by Contractor and submitted to Architect in accordance with Section 01300. Submittals contained within Project Manual. All other materials shall be furnished and installed at Contractor's expense.

PROPORTIONING AND DESIGN OF CONCRETE MIXES

Prepare design mixes for each type of concrete. Mix designs shall comply with Section 101 of City of Albuquerque Standard Specifications. Use a testing laboratory with a Licensed Professional Engineer in charge, paid for by the Contractor, and acceptable to Architect for preparing and reporting proposed mix designs. Admixtures shall not be used for cement replacement to reduce minimum cement content.

1 Concrete: fc' 3000 psi, 28 day compressive strength. Maximum wet density: 150 pcf. Slump: 3.

2
3 Basis of Mix Designs:

4
5 Control concrete mixes in accordance with U.B.C. and Chapter 4, Building Code Requirements for
6 Reinforced Concrete (ACI-318). When in the opinion of Architect it becomes necessary to increase the
7 cement content to gain the required strength, such adjustment shall be made at the Contractor's expense.

8
9 Water-Cement Ratio: Shall comply with Section 101 of City of Albuquerque Standard Specifications.

10
11 Maximum Aggregate Sizes: 3/8" to 1/2" maximum for patch work.

12
13 PART 3 - EXECUTION

14
15 PREPARATION

16
17 Building Inspection:

18
19 Prior to all work of this Section, carefully inspect the entire area designated to be altered and note
20 all objects to be removed, modified or preserved.

21
22 Locate all existing active utilities and determine all requirements for disconnection, reconnection,
23 rerouting, or capping. Use all means necessary to protect all utilities designated not to be altered
24 or changed in any manner from damage.

25
26 Scheduling: Schedule all work in a careful manner with the Owner with all necessary consideration for
27 maintaining use and operation of all areas within the building designed to be altered or added on to and
28 not to interrupt existing usage of said area or building.

29
30 PERFORMANCE: Employ skilled workmen to perform cutting and patching work. Except as otherwise
31 indicated or as approved by the Architect, proceed with cutting and patching at the earliest feasible time
32 and complete work without delay.

33
34 HAZARDOUS MATERIAL: If asbestos or other hazardous material is discovered during construction notify
35 the Architect for recommendation for handling and disposal of this material.

36
37 DEMOLITION AND REMOVAL

38
39 General: Demolition work shall be executed in orderly, careful manner, with due consideration for
40 patients, public and the Owner's personnel working in adjacent areas.

41
42 Protective Equipment: Install dust partitions, barricades, and drop cloths as required to protect
43 parts of existing work scheduled or designated to remain. Do not commence demolition until
44 Contractor has installed protective equipment and has received approval by Architect.

45
46 Housekeeping: Contractor shall work neatly, maintaining entire existing area to be remodeled
47 and adjacent spaces dusttight and secure at all times until completion of new work. Contractor
48 shall prevent accumulation of debris and overloading of any parts of the existing building shall be

1 prohibited. Protect existing duct system against accumulation and introduction of dust and
2 debris.

3
4 Specific Items of Demolition and Remodeling:

5
6 Mixing of various materials to finish a surface or plane shall not occur.
7

8 Concrete, Ceilings and Partitions: Demolish in small sections. Use bracing and shoring of existing
9 structure, etc., as required during removal, cutting of new openings, replacement of structural members,
10 etc., and to avoid collapse of large sections of removed materials. Walls, partitions and ceilings to be
11 removed shall be cut down, not tumbled, thrown or dropped.
12

13
14 Piping: Existing piping indicated for removal shall be completely removed, including hangers or
15 other support devices, and completely drained of liquid. Remove from premises in short lengths,
16 suitably capped at both ends, to prevent spillage of any trapped liquid within existing building.
17

18 Flooring: Shall be completely removed and concrete cleaned, patched and levelled.
19

20 Miscellaneous: Items not mentioned but required to be removed shall be removed in such
21 manner as will minimize damage to work to remain.
22

23 Removal of Demolished Materials: Accumulation of demolished materials is prohibited. Regardless of
24 nature of debris, it shall be immediately cleared from working area as demolition progresses. Removal
25 shall be accomplished by removing materials out through most direct route as approved by Owner. Care
26 shall be taken to avoid spilling debris. Any spilled materials shall be promptly cleaned up. All debris will
27 immediately be removed as directed or required by Architect, and through routes as approved by
28 Architect. All existing piping indicated to be removed, shall be completely removed, including hangers,
29 completely drained of any liquid, and removed in short pieces with exposed ends covered adequately to
30 prevent spilling of any trapped liquid within existing building.
31

32 CUTTING AND PATCHING
33

34 Inspection: Before cutting, examine the surfaces to be cut and patched and the conditions under which
35 the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take
36 corrective action before proceeding with the work. Review areas of potential interference and conflict
37 between the various trades. Coordinate layout of the work and resolve potential conflicts before
38 proceeding with the work.
39

40 General
41

42 Included herein is cutting and patching required for all architectural, mechanical and electrical
43 work. Where existing masonry and gypsum board partitions, etc., are indicated to be revised or
44 modified, these systems shall be revised as indicated or as reasonably implied as required to
45 match existing systems and to restore to original condition, to maintain continuity and integrity
46 of existing systems, and to maintain watertightness, etc.
47

48 The cutting of openings in concrete walls and floors for piping, duct openings, conduit, etc., within

1 the Owner occupied portion of existing buildings shall be accomplished after regular work hours
2 (between 5:00 pm and 8:00 am). All other openings may be cut during regular work hours unless
3 the process interferes with the Owner's operations. All cutting work shall be scheduled with
4 Owner at least 24 hours prior to commencing work.
5

6 Welding and Cutting Safety 7

8 Contractor shall furnish his own source of power for operation of any electric welding apparatus.
9 The Owner's electric power is not available for any welding purpose.
10

11 Where electric or gas welding or gas cutting work is done above or within ten feet of combustible
12 material or above space that may be occupied by persons, interposed shields of incombustible
13 material shall be used to protect against fire damage or injury due to sparks and hot metal.
14

15 Contractor shall have a fire watch and continuously monitor work area of potential fire hazards
16 or combustible materials. Fire watch shall have in-hand portable fire extinguisher. Inspect work
17 area at completion of operations for any live sparks or embers. Reinspect work area thirty (30)
18 minutes after work completion, then reinspect work area sixty (60) minutes later.
19

20 Cutting and welding will be permitted only in areas that are, or have been, made fire safe as
21 required by Architect. Such areas shall be essentially free of combustible and flammable contents
22 and suitably segregated from adjacent area. Any combustibles that cannot be moved shall be
23 suitably protected. Welding equipment shall not be used around flammable liquids or vapors, or
24 on tanks containing such materials. Ducts and other systems that might carry sparks or molten
25 metal to distant combustibles shall be suitably protected. Where cutting or welding is done near
26 walls, partitions, ceilings or roof of combustible construction, where conduction or radiation may
27 cause ignition, fire-resistant shields or guards shall be provided to prevent ignition.
28

29 No acetylene or oxygen tanks shall be allowed within present structure or within 10'-0" of present
30 structure. Such tanks shall be securely fastened and maintained in an upright position where
31 applicable, and when stored for use shall be remote from any combustible material and free from
32 exposure to rays of sun or too high temperatures.

33 Fire extinguishing equipment shall be maintained near all welding and cutting operations as
34 approved by Architect. When operations cease for noon hour or at end of day, surroundings
35 adjacent to welding and cutting operations shall be thoroughly wet down as directed.
36

37 Cutting 38

39 Cut the work using methods that are least likely to damage work to be retained or adjoining work.
40

41 In general, where cutting is required, use hand or small power tools designed for sawing or
42 grinding, not hammering and chopping. Cut through concrete and masonry using methods,
43 materials and techniques to ensure a neat hole. Cut holes and slots neatly to size required with
44 minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill
45 from the exposed or finished side into concealed surfaces. Temporarily cover openings when not
46 in use.
47

48 Bypass utility services such as pipe and conduit, avoid marring existing finished surfaces, cut or

1 drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when
2 not in use.

3
4 Bypass utility services such as pipe and conduit, before cuttings, where such utility services are
5 shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in walls or
6 partitions to be removed. After bypass and cutting, cap valve or plug and seal tightly remaining
7 portion of pipe and conduit to prevent entrance of moisture or other foreign matter.

8
9 CUTTING CONCRETE AND MASONRY AT INTERIORS AND NEAR THE BUILDING: In building interior and
10 within twenty feet (20') of the building at the exterior, demolish masonry walls and concrete slabs by first
11 sawing into squares not greater than two feet by two feet (2'x2') in size, then breaking free with an electric
12 jack hammer. Maximum size and type jack hammer allowable in building interiors and within twenty feet
13 (20') of the building at the exterior shall be seventy five pound (75#) electric. Use of pneumatic jack
14 hammers is forbidden at building interior of this project, and within twenty feet (20') of the building at
15 the exterior.

16
17 LEVELING OF FLOOR SURFACES: Where new floor slabs are contiguous to existing floors, and where any
18 existing floors are not level all unevenness apparent after adjoining walls are removed shall be taken up
19 by leveling new or existing floors as required. Similarly, in remodeled areas, all floors not within the
20 tolerance of 1/10" in any 10' run shall be filled and leveled as required. Tolerance required: Finished
21 surface shall be true to plane within one tenth inch (1/10") vertical in any ten foot (10') horizontal run.
22 All leveling shall be done with approved material specified in this section. Align at doors, with other floor
23 finishes or thresholds where provided.

24
25 CLEANING

26
27 Thoroughly clean areas and spaces where work is performed or used as access to work. Remove
28 completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit
29 and similar features before painting or other finishing is applied. Restore damaged pipe covering
30 to its original condition.

31
32 Upon completion of demolition work, Contractor shall remove tools, equipment and demolished
33 materials from site. Remove protections and leave interior areas vacuumed clean.

34
35 REPAIR: Contractor shall repair demolition performed in excess of that required. Return structures and
36 surfaces remaining to condition existing prior to commencement of selective demolition work. Repair
37 adjacent construction or surfaces soiled or damaged by selective demolition work.

38
39 END OF SECTION 02 4100

1 SECTION 08 6200 - SKYLIGHTS

2

3 GENERAL

4

5 SECTION INCLUDES

6 Commercial Unit Skylights.

7

8 RELATED SECTIONS

9 Rough Carpentry.

10 Flashing and Sheet Metal.

11

12 REFERENCES

13

14 Aluminum Association (AA):

15 AA M12C22A41 – Anodized Plus Finish

16

17 AA M12C22A32/A34 – Color anodized: Class II, Color Anodic Finish

18

19 American Architectural manufacturer’s Association (AAMA):

20 AAMA 501.2 – Quality Assurance and Diagnostic Water leakage Field Check of Installed
21 Storefronts, Curtain Walls, and Sloped Glazing Systems

22

23 AAMA 605.2 – Voluntary Specification for High Performance Organic Coatings

24

25 AAMA 607.1 – Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes
26 for Architectural Aluminum

27

28 AANA 602 – Voluntary Specifications and Performance Requirements and Test Procedures for
29 Combined Coatings of Anodic Oxide and Transparent Coatings on Architectural Aluminum, for
30 Finishes such as Anodized Plus

31

32 ASTM International (ASTM):

33 ASTM B209 – Standard Specification for Aluminum and Aluminum-allow Sheet and Plate

34

35 ASTM C1048 - Standard Specification for Heat-Treated Flat Glass Kind HS, Kind FT Coated and
36 Uncoated Glass

37

38 ASTM E331 – Standard Test Method for Water penetration of Exterior Windows, Curtain Walls,
39 and Doors by Uniform Static Air Pressure Difference

40

41 ASTM E773 – Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units

42

43 ASTM E774 – Standard Specification for the Classification of the Durability of Sealed Insulating
44 Glass Units

45

46 American Welding Society (AWS): AWS Structural Welding Code

47

48

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39

SUBMITTALS

Submit under provisions of Division 1.
Product Data: Manufacturer's data sheets on each product to be used, including:
Preparation instructions and recommendations.
Storage and handling requirements and recommendations.
Installation methods.
Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.

LEED Submittals (LEED Projects Only)

Provide documentation of how the requirements of Credit will be met:
List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
Manufacturer's Certificates: Certify products meet or exceed specified requirements.
Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of all components.

WARRANTY

Skylight Warranty: Provide manufacturer's 5-year limited warranty to repair or replace defects in materials or workmanship and weather-tight and leak-free performance.
Plastic Warranty: Provide manufacturer's 5-year limited warranty to repair or replace work that has or develops defects in the plastic.

PRODUCTS

Acceptable Manufacturer: American Skylights, Inc., which is located at: 1218 Corporate Dr. E., Arlington, TX 76006; Toll Free Tel: 855-772-7401; Fax: 855-445-7282;
Email: sales@americanskylights.com; Web: <http://www.americanskylights.com>

EXECUTION

Install in accordance with manufacturer's instructions.

END OF SECTION

1910

1 SECTION 08 3100 - ACCESS DOORS AND PANELS

2
3
4 PART 1 - GENERAL

5
6
7 RELATED DOCUMENTS

8
9 Drawings and general provisions of Contract, including General and Supplementary Conditions and
10 Division 1 Specification Sections, apply to this Section.

11
12
13 SUMMARY

14
15 This Section includes access doors for installation in the following types of construction:

16
17 Gypsum drywall, walls and ceilings.

18
19 Building-in of anchors and grouting of frames set in masonry construction is specified in Division 4.

20
21 Roof hatches are specified in Division 7.

22
23 Access tile in suspended or furred acoustic tile ceilings are specified in Division 9.

24
25 SUBMITTALS

26
27 General: Submit the following in accordance with Conditions of Contract and Division 1 Specification
28 Sections.

29
30 Product data in form of manufacturer's technical data and installation instructions for each type of
31 access door assembly, including setting drawings, templates, instructions, and directions for installation
32 of anchorage, devices.

33
34 Include complete schedule, including types, general locations, sizes, wall and ceiling
35 construction details, finishes, latching or locking provisions, and other data pertinent to
36 installation.

37
38 Shop drawings showing fabrication and installation of customized access doors and frames, including
39 details of each frame type, elevations of door design types, anchorage and accessory items.

40
41 Samples, 3 inches by 5 inches minimum size, of each panel face material showing factory-finished color
42 and texture.

43
44
45 QUALITY ASSURANCE

46
47 Single-Source Responsibility: Obtain access doors for entire project from one source from a single
48 manufacturer.

1910

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48

Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

FireRating: Provide access doors having fire ratings equal to those of the assemblies into which they are to be installed.

PROJECT CONDITIONS

Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.

Special-Size Access Doors: Use where required or requested; indicate on schedule.

PART 2 - PRODUCTS

MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering access doors that may be incorporated in the work include, but are not limited to, the following:

- Bar-Co., Inc.
- Cesco Products
- J.L. Industries
- Karp Associates, Inc.
- Milcor, Inc.
- The Williams Brothers Corp.

MATERIALS AND FABRICATION

General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.

Steel Access Doors and Frames: Fabricate units of continuous welded steel construction unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.

Frames: Fabricate from 16-gage steel.

1910

1 Fabricate frame with exposed flange nominal 1-inch wide around perimeter of frame for units
2 installed in the following construction:

3
4 Drywall finish.

5
6 For gypsum drywall or gypsum veneer plaster, furnish perforated frames with drywall bead.

7
8 Flush Panel Doors: Fabricate from not less than 14-gage sheet steel, with concealed spring hinges or
9 concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied
10 prime paint.

11
12 Locking Devices: Provide flush, key-operated cam locks of number required to hold door in flush,
13 smooth plane when closed.

14
15 PART 3 - EXECUTION

16
17
18 INSTALLATION

19
20 Comply with manufacturer's instructions for installation of access doors.

21
22 Coordinate installation with work of other trades.

23
24 Set frames accurately in position and securely attach to supports with face panels plumb or level in
25 relation to adjacent finish surfaces.

26
27
28 ADJUST AND CLEAN

29
30 Adjust hardware and panels after installation for proper operation.

31
32 Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

33
34
35 END OF SECTION 08 3100

1 SECTION 09 2423 - PORTLAND CEMENT STUCCO

2
3 PART 1 - GENERAL

4
5 RELATED DOCUMENTS

6
7 Drawings and general provisions of Contract, including General and Supplementary Conditions and
8 Division 1 Specification Sections, apply to this Section.

9
10 Section 01 81 13 – Sustainable Design Requirements (LEED Projects)

11
12 SCOPE Where exterior stucco is shown on Drawings, provide three-coat Portland cement plaster and
13 lath system with woven fiberglass mesh and factory-prepared finish coat as described herein.

14
15 SUMMARY

16
17 This Section includes the following:

18
19 Metal lath and furring.

20
21 Portland cement plastering.

22
23 SUBMITTALS

24
25 General: Submit the following in accordance with Conditions of Contract and Division 1 Specification
26 Sections.

27
28 Product data consisting of manufacturer's product specifications and installation instructions for each
29 product, including data showing compliance with the requirements.

30
31 Control joint layout consisting of a blueline print of the Building Elevations with the plastering
32 subcontractor's recommended control joint layout drawn in red pencil.

33
34 Sample: Provide a ten foot by ten foot sample of complete plaster and lath system at location
35 designated by Architect. It shall be the quality standard for subsequent plaster work on this project.
36 Work which does not conform to the approved sample shall be removed and replaced at no cost to
37 Owner.

38
39 LEED Submittal Requirements:

40
41 Provide the following on LEED certified projects:

42
43 Certification of quantity of recycled content in materials from this section and documentation of cost of
44 the material.

45
46 Certification of regionally extracted, harvested, or recovered, manufactured and fabricated within 500
47 miles of project site, and documentation of cost of the material.

1 Provide certified letter from stucco company listing material origin.

2

3 DELIVERY, STORAGE, AND HANDLING

4

5 Deliver materials in original packages, containers, or bundles bearing brand name and identification of
6 manufacturer.

7

8 Store materials inside, under cover, and in manner to keep them dry, protected from weather, direct
9 sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other
10 causes.

11

12 PROJECT CONDITIONS

13

14 Environmental Requirements, General: Comply with requirements of referenced plaster application
15 standards and recommendations of plaster manufacturer for environmental conditions before, during,
16 and after application of plaster.

17

18 Cold Weather Protection: When ambient outdoor temperatures are below 40 deg F (4.4 deg C),
19 maintain continuous uniform temperature of not less than 40 deg F (4.4 deg C) nor more than 80 deg F
20 (26 deg C) for not less than 1 week prior to beginning plaster application, during its application, and until
21 plaster is dry but for not less than one week after application is complete. Distribute heat evenly;
22 prevent concentrated or uneven heat from contacting plaster near heat source.

23

24 Protect contiguous work from soiling, spattering, moisture deterioration and other harmful effects that
25 might result from plastering.

26

27 PART 2 - PRODUCTS

28

29 MANUFACTURERS

30

31 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products
32 that may be incorporated in the Work include but are not limited to the following:

33

34 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

35

36 Portland Cement Plastering:

37

38 Sto, El Rey.

39

40 Expanded Metal Lath:

41

- 42 Alabama Metal Industries Corp. (AMICO)
- 43 Gold Bond Building Products Div., National Gypsum Co.
- 44 United States Gypsum Co.
- 45 Western Metal Lath Co.

46

47 Accessories:

48

- 49 Fry Reglet Corp.
- 50 Gold Bond Building Products Div., National Gypsum Co.

1 Keene Corp.
2 MM Systems Corp.
3 Plastic Components, Inc.
4 United States Gypsum Co.
5 Western Metal Lath Co.
6

7 Fasteners:

8 Hilti
9

10 LATH

11
12 Hexagonal Mesh: Provide self-furring 17 gage galvanized hexagonal wire mesh.
13

14 Expanded Metal Lath: Fabricate expanded metal lath from galvanized steel sheet to produce lath
15 complying with ASTM C 847 for type, configuration, and other characteristics indicated below.
16

17 Diamond Mesh Lath: Comply with the following requirements:

18 Configuration: Flat.

19 Weight: 3.4 lbs. per sq. yd.
20

21 Self-Furring Mesh Lath:

22 Configuration: Standard 3/8" self-furring deformations.

23 Weight: 3.4 lbs. per sq. yd.
24

25 Rib Mesh Lath, typical at exterior soffits:

26 Configuration: Standard 1/2" ribs.

27 Weight: 3.4 lbs. per sq. yd.
28

29 Lath Attachment Devices: Devices of material and type required effective building codes and
30 recommended by lath manufacturer for secure attachment of lath to framing members and of lath to
31 lath.
32

33 WOVEN FIBERGLASS MESH:

34 Mesh consists of alkali resistant woven fiber glass mesh weighing 4.5oz per square yard
35 minimum. It is to be embedded into the surface of the brown coat, or into an additional skim
36 coat applied over the brown coat, prior to the application of the finish, for increased crack
37 suppression. Provide El-Rey Krak-Master, or STO Armorwall.
38

39 PLASTER ACCESSORIES FOR PORTLAND CEMENT PLASTER

40
41 General: Comply with material provisions of ASTM C 1063; coordinate depth of accessories with
42 thicknesses and number of coats required. Provide 1" deep accessories at 3-coat stucco system.
43

44 Metal Corner Reinforcement: Expanded large-mesh diamond mesh lath fabricated from zinc-alloy or
45 welded wire mesh fabricated from 0.0475-inch-diameter zinc-coated (galvanized) wire and specially
46 formed to reinforce external corners of portland cement plaster on exterior exposures while allowing
47 full plaster encasement.

1
2 Metal Corner Beads: Small nose corner beads fabricated from zinc alloy, with expanded flanges of large-
3 mesh diamond lath to allow full encasement by plaster.

4
5 Casing Beads: Square-edged style, with expanded flanges and removable protective tape, of the
6 following material:

7
8 Material: Zinc-coated (galvanized) steel.

9
10 Control Joints: Prefabricated, of material and type indicated below:

11
12 Material: Zinc-coated (galvanized) steel.

13
14 One-Piece Type: Folded pair of nonperforated screeds in M- shaped configuration, with
15 expanded flanges.

16
17 PORTLAND CEMENT PLASTER MATERIALS

18
19 Base Coat Cements: Type as indicated below:

20
21 Portland cement, ASTM C 150, Type I or II.

22
23 Masonry cement, ASTM C 91, Type N.

24
25 Factory Prepared Finish Coat Primer: Provide Perma-Flex 400 acrylic based primer for use over
26 all base coats prior to the application of any acrylic based finish coats.

27
28 Elastomeric Base Coat: El Rey Flexible Base Coat or STO "FLEXYL".

29
30 Factory-Prepared Finish Coat: Provide STO "Powerflex Medium" or El Rey "Perma Flex" elastomeric
31 acrylic based finish coat, conforming to the following properties:

32

33 Test	Method	Criteria	Results
34 Elongation (%)	ASTM D-412	28 days	200*
35 Flexibility	ASTM D-522	½" mandrel bend @ -30°F; 26°F; 32°F; 86°F; Pass	
37 Surface Burning	ASTM E-84	<25 Flame Spread <450 Smoke Developed	15 5
39 Water Vapor 40 Permeability (US perms)	ASTM D-1653	28 days	>12
41 Water Absorption 42 (oz/ft ² /hr)	DIN 52-817	1 week	0.375
43 Wind Driven Rain 44 Dirt Pick-up	Fed TT-C-555B	24 hour driving rain	No water penetration
45 Resistance 46 Adhesion (psi)	Lab Method ASTM C-297 (modified)	56% Red oxide slurry 1 hour 28 days	89% reflectance retained >95 to concrete
47 48 Tensile Strength (psi)	ASTM D-412	28 days	60

1 *Neat film results

2
3 Sand Aggregate for Base Coats: ASTM C897.

4
5 Fiber for Base Coat: Alkaline-resistant (AR) glass or polypropylene fibers, 1/2 inch long, free of
6 contaminates, manufactured for use in portland cement plaster.

7
8 MISCELLANEOUS MATERIALS

9
10 Water for Mixing and Finishing Plaster: Drinkable and free of substances capable of affecting plaster set
11 or of damaging plaster, lath, or accessories.

12
13 Bonding Compound for Gypsum Plaster: ASTM C 631.

14
15 Bonding Agent for Portland Cement Plaster: ASTM C 932.

16 Mineral Fiber Type: Fibers manufactured from glass or slag.

17
18 PORTLAND CEMENT PLASTER MIXES AND COMPOSITIONS

19
20 General: Comply with ASTM C 926 for portland cement plaster base and finish coat mixes as applicable
21 to plaster bases, materials, and other requirements indicated.

22
23 Portland Cement Plaster Base Coat Mixes and Compositions: Proportion materials for respective base
24 coats in parts by volume for cementitious materials and in parts by volume per sum of cementitious
25 materials for aggregates to comply with the following requirements for each method of application and
26 plaster base indicated. Adjust mix proportions below within limits specified to attain workability.

27
28 Fiber Content: Add fiber to following mixes after ingredients have mixed at least 2 minutes.
29 Comply with fiber manufacturer's directions but do not to exceed 2 lbs. per cu. ft. of
30 cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

31
32 Three-Coat Work Over Metal Lath: Base coats as indicated below:

33
34 Scratch Coat: 1 part portland cement, 1 part masonry cement, 2-1/2 to 4 parts sand.

35 Brown Coat: 1 part portland cement, 1 part masonry cement, 3 to 5 parts sand.

36
37 Three-Coat Work Over Concrete Unit Masonry: Base coat as indicated below:

38
39 Scratch Coat: 1 part portland cement, 1 part masonry cement, 3 to 5 parts sand.

40
41 Brown Coat: 1 part portland cement, 1 part masonry cement, 3 to 5 parts sand.

42
43 Interior Plaster: Provide base coats same as exterior plaster systems. Finish brown coat to match
44 texture of adjacent work. If smooth, apply an additional finish coat of drywall joint compound and sand
45 smooth.

46
47 Factory-Prepared Finish Coats: Install in accordance with manufacturer's instructions.

1 MIXING

2
3 Mechanically mix cementitious and aggregate materials for plasters to comply with applicable
4 referenced application standard and with recommendations of plaster manufacturer.

5
6 PART 3 - EXECUTION

7
8 INSTALLATION OF LATHING AND FURRING, GENERAL

9
10 Portland Cement Plaster Lathing and Furring Installation Standard: Install lathing and furring materials
11 indicated for portland cement plaster to comply with ASTM C 1063.

12
13 Install supplementary framing, blocking, and bracing at terminations in the work and for support of
14 fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar work to
15 comply with details indicated or, if not otherwise indicated, to comply with applicable published
16 recommendations of gypsum plaster manufacturer or, if not available, of "Gypsum Construction
17 Handbook" published by United States Gypsum Co.

18
19 Isolation: Where lathing and metal support system abuts building structure horizontally and where
20 partition/wall work abuts overhead structure, isolate the work from structural movement sufficiently to
21 prevent transfer of loading into the work from the building structure. Install slip- or cushion-type joints
22 to absorb deflections but maintain lateral support.

23
24 Frame both sides of control and expansion joints independently, and do not bridge joints with
25 furring and lathing or accessories.

26
27 METAL LATHING

28
29 Install metal lath for the following applications where plaster base coats are required. Provide
30 appropriate type, configuration, and weight of metal lath selected from materials indicated that comply
31 with referenced lathing installation standards.

32
33 Vertical metal framing and furring: Provide self-furring 17 gage hexagonal wire mesh.

34
35 Special details and corner reinforcement at openings: Provide expanded metal lath.

36
37 Monolithic surfaces not complying with requirements of referenced plaster application
38 standards for characteristics that permit direct bond with plaster: Provide self-furring 17 gage
39 hexagonal wire mesh.

40
41 Soffits: Provide self-furring mesh lath at all soffits.

42
43 Fastening: Screw lath to framing in accordance with Building Code requirements. Fasten lath to
44 masonry using Hilti X-IE insulation fasteners. Use correct length fastener for insulation and lath
45 assembly. Provide fasteners spaced as required by Building Code. Provide additional fasteners
46 as necessary to support accessories such as corner bead, expansion joint, and casing bead.

1 INSTALLATION OF PLASTERING ACCESSORIES

2
3 General: Comply with referenced lathing and furring installation standards for provision and location of
4 plaster accessories of type indicated. Miter or cope accessories at corners; install with tight joints and in
5 alignment. Attach accessories securely to plaster bases to hold accessories in place and alignment
6 during plastering.
7

8 Accessories for Portland Cement Plaster: Provide the following types to comply with requirements
9 indicated for location:

10
11 Corner Reinforcement: Install at external corners.

12
13 Corner Bead: Install at external corners.

14
15 Casing Beads: Install at all terminations of plaster work unless otherwise indicated.

16
17 Control Joints: Install control joints at locations indicated or, if not indicated, at locations
18 complying with the following criteria and approved by Architect.

19
20 Where an expansion or control joint occurs in surface of construction directly behind
21 plaster membrane.

22
23 Where plaster panel sizes or dimensions change, extend joints full width or height of
24 plaster membrane.

25
26 For Portland Cement Plaster: Where, in surfaces of ceilings and walls, distances
27 between and areas within control joints exceed, respectively, the following
28 measurements:

29
30 10 feet in either direction and 100 sq. ft.

31 32 PLASTER APPLICATION, GENERAL

33
34 Prepare monolithic surfaces for bonded base coats and use bonding compound or agent to comply with
35 requirements of referenced plaster application standards for conditioning of monolithic surfaces.

36
37 Elastomeric Base Coat: Provide elastomeric base coat at all horizontal and near-horizontal surfaces such
38 as parapet tops and window sills in addition to typical base coats.

39
40 Tolerances: Do not deviate more than 1/8 inch in 10'-0" from a true plane in finished plaster surfaces,
41 as measured by a 10'-0" straightedge placed at any location on surface.

42
43 Grout hollow metal frames, bases, and similar work occurring in gypsum plastered areas, with base coat
44 plaster material, and prior to lathing where necessary. Except where full grouting is indicated or
45 required for fire-resistance rating, grout at least 6 inches at each jamb anchor clip.

46
47 Sequence plaster application with the installation and protection of other work so that neither will be
48 damaged by the installation of the other.

1
2 Plaster flush with metal frames and other built-in metal items or accessories that act as a plaster
3 ground, unless otherwise indicated. Where plaster is not terminated at metal by casing beads, cut base
4 coat free from metal before plaster sets and groove finish coat at the junctures with metal.

5
6 Apply thicknesses and number of coats of plaster as indicated or as required by referenced standards.
7

8 Concealed Plaster: Where plaster application will be concealed by wood paneling, above suspended
9 ceilings and similar locations, finish coat may be omitted; where concealed behind cabinets and similar
10 furnishings and equipment, apply finish coat; where used as a base for adhesive application of tile and
11 similar finishes, omit finish coat and coordinate thickness with overall dimension as shown and comply
12 with tolerances specified.

13 PORTLAND CEMENT PLASTER APPLICATION

14 Portland Cement Plaster Application Standard: Apply portland cement plaster materials, compositions,
15 and mixes to comply with ASTM C 926.
16
17

18
19 Number of Coats: Apply portland cement plaster, of composition indicated, to comply with the
20 following requirements:
21

22 Use three-coat work over the following plaster bases:

23
24 Metal lath.

25
26 Concrete unit masonry.

27
28 Concrete, cast-in-place or precast when surface complies with ASTM C 926 for plaster
29 bonded direct to solid base.

30
31 Finish Coat: Floated finish unless otherwise indicated; match Architect's sample for texture and
32 color.
33

34 Primer: Apply primer over all surfaces to receive acrylic based finish coats and allow to dry until
35 tacky. Trowel apply and then float acrylic based finish in number of coats and consistency to
36 match Architects approved samples for texture and color.
37

38 Exterior Patching and Refinish Work: Where "Patch and refinish exterior plaster" is called out on
39 Drawings, perform the following operations:
40

41 Water blast existing finish coat. Wire brush and scrape away any loose finish or base coat
42 plaster.
43

44 Fill voids with exterior base coat plaster mixed using a water and El Rey 200. Modify the cement
45 based patching material with El Rey's Superior Additive 200 at a ratio of 3 parts water to 1 part
46 Superior Additive 200. Over-lap this patch material onto existing and then embed a strip of the
47 Krak-Master mesh, taking care to completely cover the mesh with the wet patching material.
48 Allow to fully cure then apply primer/bonding agent over entire walls to receive finish coat.

1
2 Coat the entire surface to be refinished with El Rey 100 as described in manufacturer's
3 literature.

4
5 Install acrylic based factory prepared finish coat.

6
7 Moist-cure portland cement plaster base and finish coats to comply with ASTM C 926, including
8 recommendations for time between coats and curing in "Annex A2 Design Considerations."

9
10 CUTTING AND PATCHING

11
12 Cut, patch, point up, and repair plaster as necessary to accommodate
13 other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters,
14 buckles, excessive crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects
15 and where bond to the substrate has failed.

16
17 Sand smooth-troweled finishes lightly to remove trowel marks and arrises.

18
19 CLEANING AND PROTECTION

20
21 Remove temporary protection and enclosure of other work. Promptly remove plaster from door
22 frames, windows, and other surfaces that are not to be plastered. Repair floors, walls, and other
23 surfaces that have been stained, marred, or otherwise damaged during the plastering work. When
24 plastering work is completed, remove unused materials, containers, and equipment and clean floors of
25 plaster debris.

26
27 Provide final protection and maintain conditions, in a manner suitable to Installer that ensure plaster
28 work's being without damage or deterioration at time of Substantial Completion.

29
30 END OF SECTION 09 2423

1 SECTION 09 9000 – PAINTING AND COATING

2
3 PART 1 - GENERAL

4
5 Certification: Provide Contract Conformance certification for products, assemblies, accessories and
6 installation.

7
8 RELATED DOCUMENTS

9
10 Drawings and general provisions of Contract, including General and Supplementary Conditions and
11 Division 1 Specification sections, apply to this section.

12
13 Section 01 8113 – Sustainable Design Requirements (LEED Projects)

14
15 SUMMARY

16
17 This Section includes surface preparation, painting, and finishing of exposed interior and exterior items
18 and surfaces. "Exposed" for purposes of this specification means visible from any direction.

19
20 Surface preparation, priming, and finish coats specified in this section are in addition to shop
21 priming and surface treatment specified under other sections.

22
23 Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or
24 material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not
25 specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not
26 designated, the Architect will select from standard colors or finishes available.

27
28 Painting includes field painting exposed bare and covered pipes and ducts (including color coding),
29 hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical
30 equipment. It is possible that pipes and ducts could be painted before installation to achieve the
31 "all-over" coverage required by this specification.

32
33 Paint exposed gas piping on roof safety yellow.

34
35 Exposed concrete floors and all exterior architectural concrete (Columns, beams, lintels, etc.)
36 shall be sealed with concrete sealer as specified herein whether shown on drawings or not.

37
38 Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts,
39 and labels.

40
41 Prefinished items not to be painted include the following factory-finished components:

- 42
43 Metal toilet enclosures
44 Acoustic materials
45 Architectural woodwork and casework
46 Finished mechanical and electrical equipment
47 Light fixtures
48 Switchgear

1 Distribution cabinets

2
3 Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally
4 inaccessible areas:

5
6 Furred areas
7 Utility tunnels
8 Pipe spaces
9 Duct shafts

10
11 Finished metal surfaces not to be painted include:

12
13 Anodized aluminum
14 Stainless steel

15
16 Operating parts not to be painted include moving parts of operating equipment such as the
17 following:

18
19 Valve and damper operators
20 Linkages
21 Sensing devices
22 Motor and fan shafts

23
24 Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required
25 labels or equipment name, identification, performance rating, or nomenclature plates.

26
27 Miscellaneous items not to be painted:

28 Cast iron gratings
29 Ducts, conduits, equipment, etc. in spaces indicated as "exposed structure unpainted: on the
30 room finish schedule.
31 Aluminum Ductwork

32
33 LEED Compliance

34 Paints and coatings used on the interior of the building (defined as inside of the weatherproofing system
35 and applied on-site) shall comply with Section 01 8113 – Sustainable Design Requirements.

36
37 SUBMITTALS

38
39 Product Data: Manufacturer's technical information, label analysis, and application instructions for each
40 material proposed for use.

41
42 List each material and cross-reference the specific coating and finish system and application.
43 Identify each material by the manufacturer's catalog number and general classification.

44
45 Organize paint systems to correspond to paint schedules in this Section.

46
47 Samples for initial color selection in the form of manufacturer's color charts.

1 After color selection, the Architect will furnish color chips for surfaces to be coated.
2

3 QUALITY ASSURANCE

4
5 Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer
6 as the finish coats.
7

8 Coordination of Work: Review other sections in which primers are provided to ensure compatibility of
9 the total systems for various substrates. On request, furnish information on characteristics of finish
10 materials to ensure use of compatible primers.
11

12 Notify the Architect of problems anticipated using the materials specified.
13

14 Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating
15 types specified. Paint material containers not displaying manufacturer's product identification will not be
16 acceptable.
17

18 Proprietary names used to designate colors or materials are not intended to imply that products
19 named are required or to exclude equal products of other manufacturers.
20

21 DELIVERY, STORAGE, AND HANDLING

22
23 Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing
24 manufacturer's name and label and the following information:
25

- 26 Product name or title of material
- 27 Product description (generic classification or binder type)
- 28 Manufacturer's stock number and date of manufacture
- 29 Contents by volume, for pigment and vehicle constituents
- 30 Thinning instructions
- 31 Application instructions
- 32 Color name and number
33

34 Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient
35 temperature of 45 deg. F. (7 deg. C). Maintain containers used in storage in a clean condition, free of
36 foreign materials and residue.
37

38 Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.
39 Take necessary measures to ensure that workers and work areas are protected from fire and
40 health hazards resulting from handling, mixing, and application.
41

42 JOB CONDITIONS

43
44 Apply Ferrous metal primers in shops remote from finish interiors of this project. Only touch-up of interior
45 prime-painted ferrous metal products is permitted at the job site.
46

47 Apply water-based paints only when the temperature of surfaces to be painted and surrounding air
48 temperatures are between 50 deg. F (10 deg. C) and 90 deg F (32 deg. C).

1
2 Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air
3 temperatures are between 45 deg. F (7 deg. C) and 95 deg F (35 deg. C).

4
5 Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at
6 temperatures less than 5 deg. F (3 deg. C) above the dew point, or to damp or wet surfaces.

7
8 Painting may continue during inclement weather if surfaces and areas to be painted are enclosed
9 and heated within temperature limits specified by the manufacturer during application and drying
10 periods.

11 PART 2 - PRODUCTS

12 MANUFACTURERS

13 Available Manufacturers:

14
15
16 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that
17 may be incorporated in the work include but are not limited to the following:

18
19
20
21 Dunn-Edwards
22 Devoe and Reynolds Co. (Devoe)
23 The Glidden Company (Glidden)
24 Benjamin Moore and Co. (Moore)
25 PPG Industries, Pittsburgh Paints (Pittsburgh)
26 Pratt and Lambert (P & L)
27 The Sherwin-Williams Co. (S-W)
28 KWAL

29
30 Basis of Design: Provide products indicated or equal as approved by architect prior to bidding.

31 PART 3 - EXECUTION

32 EXAMINATION

33
34
35
36 Examine substrates and conditions under which painting will be performed for compliance with
37 requirements for application of paint. Do not begin paint application until unsatisfactory conditions have
38 been corrected.

39
40 Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within
41 a particular area.

42 PREPARATION

43
44
45 General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting
46 fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior
47 to surface preparation and painting. Remove these items if necessary for complete painting of the items

1 and adjacent surfaces. Following completion of painting operations in each space or area, have items
2 reinstalled by workers skilled in the trades involved.

3
4 Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to
5 cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning
6 process will not fall on wet, newly painted surfaces.
7

8 Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's
9 instructions for each particular substrate condition and as specified.

10
11 Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in
12 writing of problems anticipated with using the specified finish-coat material with substrates
13 primed by others.
14

15 Cementitious Materials: Prepare concrete, concrete masonry block, to be painted. Remove
16 efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove
17 glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of
18 surface preparation.

19
20 Use abrasive blast-cleaning methods if recommended by the paint manufacturer.

21
22 Determine alkalinity and moisture content of surfaces by performing appropriate tests.
23 If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct
24 this condition before application. Do not paint surfaces where moisture content exceeds
25 that permitted in manufacturer's printed directions.
26

27 Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other
28 etching cleaner. Flush the floor with clean water to remove acid, neutralize with
29 ammonia, and rinse; allow to dry and vacuum before painting.
30

31 Ferrous Metals: Clean nongalvanized ferrous-metal surfaces that have not been shop coated;
32 remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical
33 cleaning methods that comply with recommendations of the Steel Structures Painting Council.
34

35 Blast steel surfaces clean as recommended by the paint system manufacturer and in
36 accordance with requirements of SSPC specification SSPC-SP 10.

37
38 Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat
39 before priming.
40

41 Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush,
42 clean with solvents recommended by the paint manufacturer, and touch up with the same
43 primer as the shop coat.
44

45 Galvanized Surfaces: Clean galvanized surfaces with non-petroleum-based solvents so that the
46 surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet
47 metal fabricated from coil stock by mechanical methods.
48

1 Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's
2 directions.

3
4 Maintain containers used in mixing and application of paint in a clean condition, free of foreign
5 materials and residue.

6
7 Stir material before application to produce a mixture of uniform density; stir as required during
8 application. Do not stir surface film into material. Remove film and, if necessary, strain material
9 before using.

10
11 Use only thinners approved by the paint manufacturer, and only within recommended limits.

12 APPLICATION

13
14
15 Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for
16 substrate and type of material being applied.

17
18 Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to
19 formation of a durable paint film.

20
21 Paint colors, surface treatments, and finishes are indicated in "schedules."

22
23 Provide finish coats that are compatible with primers used.

24
25 The number of coats and film thickness required is the same regardless of the application method.
26 Do not apply succeeding coats until the previous coat has cured as recommended by the
27 manufacturer. Sand between applications where sanding is required to produce an even smooth
28 surface in accordance with the manufacturer's directions.

29
30 Apply additional coats when undercoats, stains, or other conditions show through final coat of
31 paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure
32 that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film
33 thickness equivalent to that of flat surfaces.

34
35 The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector
36 covers, covers for finned tube radiation, grilles, and similar components are in place. Extend
37 coatings in these areas as required to maintain the system integrity and provide desired
38 protection.

39
40 Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint
41 surfaces behind permanently fixed equipment or furniture with prime coat only before final
42 installation of equipment.

43
44 Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular
45 black paint.

46
47 Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
48

1 Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

2
3 Finish exterior doors on tops, bottoms, and side edges same as exterior faces.

4
5 Sand lightly between each succeeding enamel or varnish coat.

6
7 Omit primer on metal surfaces that have been shop-primed and touch up painted.

8
9 Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise
10 prepared for painting as soon as practicable after preparation and before subsequent surface
11 deterioration.

12
13 Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint
14 has dried to where it feels firm, and does not deform or feel sticky under moderate thumb
15 pressure and where application of another coat of paint does not cause lifting or loss of adhesion
16 of the undercoat.

17
18 Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended
19 spreading rate. Provide a total dry film thickness of the entire system as recommended by the
20 manufacturer.

21
22 Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in
23 mechanical equipment rooms and in occupied spaces.

24
25 Mechanical items to be painted include but are not limited to:

26
27 Piping, pipe hangers, and supports
28 Ductwork
29 Insulation
30 Supports
31 Motors and mechanical equipment
32 Accessory items

33
34 Electrical items to be painted include but are not limited to:

35
36 Exposed conduit boxes and fittings
37 Exposed switchgear and electrical panels at interior and exterior of building

38
39 Hollow metal assemblies which include glazing shall be painted prior to installation of glazing. Paint
40 frames and stops separately before assembly.

41
42 Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with
43 pores filled.

44
45 Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the
46 manufacturer to material that is required to be painted or finished and has not been prime coated by
47 others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat
48 appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

1
2 Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling
3 such as laps, irregularity in texture, skid marks, or other surface imperfections.

4
5 Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish,
6 color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness,
7 or other surface imperfections will not be acceptable.

8
9 Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster.
10 Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or
11 other surface imperfections.

12
13 Provide satin finish for final coats.

14
15 Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint
16 work not in compliance with specified requirements.

17 18 FIELD QUALITY CONTROL

19
20 The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner
21 deems necessary during the period when paint is being applied:

22
23 The Owner will engage the services of an independent testing laboratory to sample the paint
24 material being used. Samples of material delivered to the project will be taken, identified, sealed,
25 and certified in the presence of the Contractor.

26
27 The testing laboratory will perform appropriate tests for the following characteristics as required
28 by the Owner:

29
30 Quantitative materials analysis
31 Abrasion resistance
32 Apparent reflectivity
33 Flexibility
34 Washability
35 Absorption
36 Accelerated weathering
37 Dry opacity
38 Accelerated yellowness
39 Recoating
40 Skinning
41 Color retention
42 Alkali and mildew resistance

43
44 If test results show material being used does not comply with specified requirements, the
45 Contractor may be directed to stop painting, remove non-complying paint, pay for testing, repaint
46 surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces
47 if, upon repainting with specified paint, the two coatings are noncompatible.
48

CLEANING

Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

PROTECTION

Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

Extra Stock

Furnish unopened, one gallon of each type and color of paint, labeled with color and Architect's paint schedule number.

EXTERIOR PAINT SCHEDULE

General: Provide the following paint systems for the various substrates indicated.

Ferrous Metal System:

Oil-Based Alkyd Enamel, Semi-Gloss (2.5 mils DFT):

1st Coat: Oil-Based Synthetic Rust Inhibiting Primer (FS TT-P-641)

2nd Coat: Oil-Based Alkyd Semi-Gloss Enamel (FS TT-E-489)

3rd Coat: Oil-Based Alkyd Semi-Gloss Enamel (FS TT-E-489)

Important: Thoroughly clean all oil off bare metal using mineral spirit wash.

Zinc-Coated Metal System:

Oil-Based Alkyd Enamel, Semi-Gloss (2.5 mils DFT):

1st Coat: Oil-Based Galvanized Metal Primer (FS TT-P-641)

2nd Coat: Oil-Based Alkyd Semi-Gloss Enamel (FS TT-E-489)

3rd Coat: Oil-Based Alkyd Semi-Gloss Enamel (FS TT-E-489)

Shop-Primed Metal System:

Oil-Based Alkyd Enamel, Semi-Gloss (2.5 mils DFT):

1st Coat: Oil-Based Alkyd Semi-Gloss Enamel (FS TT-E-489)

2nd Coat: Oil-Based Alkyd Semi-Gloss Enamel (FS TT-E-489)

Exterior "Architectural" Concrete System:

Apply three (3) coats H & C Silicone Acrylic Concrete Sealer to all exterior "architectural" concrete.

1
2 **INTERIOR PAINT SCHEDULE**

3
4 Provide products meeting the VOC requirements as set forth in Division 1 Sustainability Design
5 Requirements at all interior locations.

6
7 **Concrete Walls and Ceilings (Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up,
8 Cast-In-Place, Plaster)**

9 Water-Based Epoxy System, Semi -Gloss Finish:

10 1st Coat: S-W Waterbased Catalyzed Epoxy Semi-Gloss, B70W211/ B60V25

11 2nd Coat: S-W Waterbased Catalyzed Epoxy Semi-Gloss, B70W211/ B60V25
12 (6.5 mils wet, 2.5 mils dry per coat)

13
14 **Masonry (Smooth, Split Face, Scored, Fluted)**

15 Water-Based Epoxy System, Semi -Gloss Finish:

16 1st Coat: S-W Heavy Duty Block Filler, B42W46
17 (50-88 sq ft/gal)

18 2nd Coat: S-W Waterbased Catalyzed Epoxy Semi-Gloss, B70W211/ B60V25

19 3rd Coat: S-W Waterbased Catalyzed Epoxy Semi-Gloss, B70W211/ B60V25
20 (6.5 mils wet, 2.5 mils dry per coat)

21
22 **Aluminum and Galvanized Metal**

23 Water-Based Epoxy System, Semi -Gloss Finish:

24 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
25 (5.0 mils wet, 2.0 mils dry)

26 2nd Coat: S-W Waterbased Catalyzed Epoxy Semi-Gloss, B70W211/ B60V25

27 3rd Coat: S-W Waterbased Catalyzed Epoxy Semi-Gloss, B70W211/ B60V25
28 (6.5 mils wet, 2.5 mils dry per coat)

29
30 **Ferrous Metal (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous & Ornamental Iron,
31 Structural Iron, Hollow Metal Door Frames)**

32 Water-Based Epoxy System, Semi-Gloss Finish:

33 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
34 (5.0 mils wet, 2.0 mils dry)

35 2nd Coat: S-W Waterbased Catalyzed Epoxy Semi-Gloss, B70W211/ B60V25

36 3rd Coat: S-W Waterbased Catalyzed Epoxy Semi-Gloss, B70W211/ B60V25
37 (6.5 mils wet, 2.5 mils dry per coat)

38
39 **Painted Wood (Walls, Ceilings, Doors, Trim)**

40 Water-Based Alkyd System, Semi-Gloss Finish:

41 1st Coat: S-W Premium Wall & Wood Primer, B28W8111
42 (4.0 mils wet, 1.8 mils dry)

43 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series

44 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series
45 (4.0 mils wet, 1.7 mils dry per coat)

46
47 **Stained Wood (Walls, Ceilings, Doors, Trim)**

48 Stain and Varnish System, Satin Finish:

- 1 1st Coat: S-W WoodClassics 250 Stains
2 2nd Coat: S-W WoodClassics Waterbased Polyurethane Varnish Satin, A68 Series
3 3rd Coat: S-W WoodClassics Waterbased Polyurethane Varnish Satin, A68 Series
4 (4.0 mils wet, 1.0 mil dry per coat)
5

6 Gypsum Board (Non-damp Areas)

- 7 Latex System, Semi-Gloss Finish:
8 1st Coat: S-W Harmony Interior Latex Primer, B11
9 (4.0 mils wet, 1.3 mils dry)
10 2nd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series
11 3rd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series
12 (4.0 mils wet, 1.6 mils dry per coat)
13

14 Gypsum Board (Damp Areas)

- 15 Water-Based Epoxy System, Gloss Finish:
16 1st Coat: S-W Harmony Interior Latex Primer, B11
17 (4.0 mils wet, 1.3 mils dry)
18 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series
19 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series
20 (5.0 mils wet, 2.0 mils dry per coat)
21

22 Exposed Concrete Floor System – Solvent Sealed (non-polished concrete)

23 Apply three (3) coats H & C Low VOC Concrete Sealer Solid Color Solvent-Based.
24

25 Exposed Concrete Floor System – Epoxy Sealed (non-polished concrete)

26 Apply two (2) coats Sherwin Williams ArmorSeal 8100 water based epoxy floor coating. Provide
27 custom colors.
28

29 Polished Concrete Slabs

30 No topical sealer allowed.
31

32 END OF SECTION 09 9000

1 SECTION 21 1313 - WET-PIPE SPRINKLER SYSTEMS

2
3 GENERAL

4
5 Related Documents

6 Drawings and general provisions of the Contract, including General and Supplementary
7 Conditions and Division 01 Specification Sections, apply to this Section.
8

9 Summary

10 Section Includes:

- 11 Pipes, fittings, and specialties.
 - 12 Fire-protection valves.
 - 13 Fire-department connections.
 - 14 Sprinklers.
 - 15 Alarm devices.
 - 16 Manual control stations.
 - 17 Control panels.
 - 18 Pressure gages.
- 19

20 Definitions

21 Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at
22 working pressure of 175 psig maximum.
23

24 System Descriptions

25 Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and
26 that is connected to water supply through alarm valve. Water discharges immediately from
27 sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys
28 frangible device. Hose connections are included if indicated.
29

30 Performance Requirements

31 Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
32

33 Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by
34 a qualified professional engineer, using performance requirements and design criteria indicated.
35 Sprinkler system design shall be approved by authorities having jurisdiction.

36 Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses
37 through water-service piping, valves, and backflow preventers.

38 Minimum Density for Automatic-Sprinkler Piping Design:

39 Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. (4.1 mm/min. over 139-sq. m) area.
40 Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. (6.1 mm/min.
41 over 139-sq. m)

42 Maximum Protection Area per Sprinkler: Per UL listing.
43

44 Submittals

45 Product Data: For each type of product indicated. Include rated capacities, operating
46 characteristics, electrical characteristics, and furnished specialties and accessories.

47 Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and
48 attachments to other work.

- 1 Wiring Diagrams: For power, signal, and control wiring.
 2 Delegated-Design Submittal: For sprinkler systems indicated to comply with performance
 3 requirements and design criteria, including analysis data signed and sealed by the qualified
 4 professional engineer responsible for their preparation.
 5 Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are
 6 shown and coordinated with each other, using input from installers of the items involved:
 7 Domestic water piping.
 8 HVAC hydronic piping.
 9 Items penetrating finished ceiling include the following:
 10 Lighting fixtures.
 11 Air outlets and inlets.
 12 Fire alarm devices.
 13 HVAC Ductwork.
 14 Ceiling heights.
 15 Qualification Data: For qualified Installer and professional engineer.
 16 Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have
 17 been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
 18 Welding certificates.
 19 Fire-hydrant flow test report.
 20 Field Test Reports and Certificates: Indicate and interpret test results for compliance with
 21 performance requirements and as described in NFPA 13. Include "Contractor's Material and
 22 Test Certificate for Aboveground Piping."
 23 Field quality-control reports.
 24 Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation,
 25 and maintenance manuals.

- 26
 27 Quality Assurance
 28 Installer Qualifications:
 29 Installer's responsibilities include designing, fabricating, and installing sprinkler systems and
 30 providing professional engineering services needed to assume engineering responsibility. Base
 31 calculations on results of fire-hydrant flow test.
 32 Engineering Responsibility: Preparation of working plans, calculations, and field test
 33 reports by a qualified professional engineer.
 34 Welding Qualifications: Qualify procedures and operators according to ASME Boiler and
 35 Pressure Vessel Code.
 36 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by
 37 a qualified testing agency, and marked for intended location and application.
 38 NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing
 39 shall comply with the following:
 40 NFPA 13, "Installation of Sprinkler Systems."

- 41
 42 Coordination
 43 Coordinate layout and installation of sprinklers with other construction that penetrates ceilings,
 44 including light fixtures, HVAC equipment, and partition assemblies.

- 45
 46 Extra Materials
 47 Furnish extra materials that match products installed and that are packaged with protective
 48 covering for storage and identified with labels describing contents.

1
2 Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for
3 minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required
4 by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each
5 type of sprinkler used on Project.
6

7 PRODUCTS

8 9 Piping Materials

10 Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting
11 materials, and for joining methods for specific services, service locations, and pipe sizes.
12

13 Steel Pipe And Fittings

14 Standard Weight, Black Steel Pipe: ASTM A 53/A 53M. Pipe ends may be factory or field formed
15 to match joining method.
16

17 Listed Fire-Protection Valves

18 19 General Requirements:

20 Valves shall be UL listed or FM approved.

21 Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.
22

23 Ball Valves:

24 Manufacturers: Subject to compliance with requirements, provide products by one of
25 the following:

26 Anvil International

27 Victaulic Company

28 Standard: UL 1091 except with ball instead of disc.

29 Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.

30 Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body
31 with grooved ends.

32 Valves NPS 3: Ductile-iron body with grooved ends.
33

34 Iron Butterfly Valves:

35 Standard: UL 1091.

36 Pressure Rating: 175 psig.

37 Body Material: Cast or ductile iron.

38 Style: Lug or wafer.

39 End Connections: Grooved.
40

41 Check Valves:

42 Manufacturers: Subject to compliance with requirements, provide products by one of
43 the following:

44 Anvil International

45 Milwaukee Valve Company

46 Potter Roemer

47 Tyco Fire & Building Products

48 Standard: UL 312.

1 Pressure Rating: 250 psig minimum.
2 Type: Swing check.
3 Body Material: Cast iron.
4 End Connections: Flanged or grooved.
5

6 Iron OS&Y Gate Valves:

7 Manufacturers: Subject to compliance with requirements, provide products by one of
8 the following:

9 Crane Co.
10 Milwaukee Valve Company
11 Nibco
12 Tyco Fire & Building Products
13 Standard: UL 262.

14 Pressure Rating: 250 psig minimum.
15 Body Material: Cast or ductile iron.
16 End Connections: Flanged or grooved.
17

18 Indicating-Type Butterfly Valves:

19 Manufacturers: Subject to compliance with requirements, provide products by one of
20 the following:

21 Anvil International
22 Milwaukee Valve Company
23 Nibco
24 Tyco Fire & Building Products
25 Standard: UL 1091.

26 Pressure Rating: 175 psig minimum.
27 Valves NPS 2 and Smaller:
28 Valve Type: Ball or butterfly.
29 Body Material: Bronze.
30 End Connections: Threaded.
31 Valves NPS 2-1/2 and Larger:
32 Valve Type: Butterfly.
33 Body Material: Cast or ductile iron.
34 End Connections: Flanged, grooved, or wafer.
35 Valve Operation: Integral electrical, 115-V ac, prewired, two-circuit, supervisory
36 switch indicating device.
37

38 NRS Gate Valves:

39 Manufacturers: Subject to compliance with requirements, provide products by one of
40 the following:

41 Crane
42 Nibco
43 Tyco
44 Standard: UL 262.
45 Pressure Rating: 250 psig minimum.

46 Body Material: Cast iron with indicator post flange.
47 Stem: Nonrising.
48 End Connections: Flanged or grooved.

Indicator Posts:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Crane

Nibco

Tyco

Standard: UL 789.

Type: Horizontal for wall mounting.

Body Material: Cast iron with extension rod and locking device.

Operation: Wrench.

Trim And Drain ValvesGeneral Requirements:

Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

Pressure Rating: 175 psig minimum.

Angle Valves:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Fire Protection Products

United Brass Works

Specialty ValvesGeneral Requirements:

Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

Pressure Rating:

Standard-Pressure Piping Specialty Valves: 175 psig (1200 kPa) minimum.

Body Material: Cast or ductile iron.

Size: Same as connected piping.

End Connections: Flanged or grooved.

Alarm Valves:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Reliable Automatic Sprinkler Co., Inc.

Tyco

Victaulic

Viking

Standard: UL 193.

Design: For horizontal or vertical installation.

Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.

Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.

Automatic (Ball Drip) Drain Valves:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Reliable

Tyco

1 Standard: UL 1726.
 2 Pressure Rating: 175 psig minimum.
 3 Type: Automatic draining, ball check.
 4 Size: NPS 3/4.
 5 End Connections: Threaded.
 6

7 Fire-Department Connections

8 Manufacturers:

9 AFAC Inc.
 10 Central Sprinkler Corp.
 11 Elkhart Brass Mfg. Co., Inc.
 12 Fire-End and Croker Corp.
 13 Fire Protection Products, Inc.
 14 GMR International Equipment Corporation
 15 Guardian Fire Equipment Incorporated
 16 Potter-Roemer; Fire-Protection Div.
 17 Reliable Automatic Sprinkler Co., Inc.
 18 United Brass Works, Inc.

19 Exposed, Freestanding-Type, Fire Department Connection: UL 405, 175-psig minimum pressure
 20 rating; with corrosion-resistant-metal body, brass inlets with threads according to NFPA 1963
 21 and matching local fire department sizes and threads, and bottom outlet with pipe threads.
 22 Include brass lugged caps, gaskets, and brass chains; brass lugged swivel connection and drop
 23 clapper for each hose-connection inlet; 18-inch-high, brass sleeve; and round, floor, brass
 24 escutcheon plate with marking "AUTO SPKR & STANDPIPE."

25 Finish Including Sleeve: Polished brass.
 26

27 Sprinkler Specialty Pipe Fittings

28 Branch Outlet Fittings:

29 Standard: UL 213.
 30 Pressure Rating: 175 psig minimum.
 31 Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 32 Type: Mechanical-T and -cross fittings.
 33 Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
 34 Size: Of dimension to fit onto sprinkler main and with outlet connections as
 35 required to match connected branch piping.
 36 Branch Outlets: Grooved, plain-end pipe, or threaded.
 37

38 Flow Detection and Test Assemblies:

39 Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide,"
 40 published by FM Global, listing.
 41 Pressure Rating: 175 psig minimum.
 42 Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test
 43 valve.
 44 Size: Same as connected piping.
 45 Inlet and Outlet: Threaded.

46 Branch Line Testers:

47 Standard: UL 199.
 48 Pressure Rating: 175 psig.

1 Body Material: Brass.
 2 Size: Same as connected piping.
 3 Inlet: Threaded.
 4 Drain Outlet: Threaded and capped.
 5 Branch Outlet: Threaded, for sprinkler.

6 Sprinkler Inspector's Test Fittings:

7 Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide,"
 8 published by FM Global, listing.
 9 Pressure Rating: 175 psig minimum.
 10 Body Material: Cast- or ductile-iron housing with sight glass.
 11 Size: Same as connected piping.
 12 Inlet and Outlet: Threaded.

13 Adjustable Drop Nipples:

14 Standard: UL 1474.
 15 Pressure Rating: 250 psig minimum.
 16 Body Material: Steel pipe with EPDM-rubber O-ring seals.
 17 Size: Same as connected piping.
 18 Length: Adjustable.
 19 Inlet and Outlet: Threaded.

20 Sprinklers

21
 22 General Requirements:

23 Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide,"
 24 published by FM Global, listing.
 25 Pressure Rating for Automatic Sprinklers: 175 psig minimum.

26 Automatic Sprinklers with Heat-Responsive Element:

27 Early-Suppression, Fast-Response Applications: UL 1767
 28 Nonresidential Applications: UL 199.
 29 Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for
 30 "Ordinary" temperature classification rating unless otherwise indicated or required by
 31 application.

32 Sprinkler Finishes:

33 Chrome plated.

34 Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting
 35 applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with
 36 sprinklers.

37 Ceiling Mounting Chrome-plated steel, two piece, with 1-inch vertical adjustment.

38 Sidewall Mounting: Chrome-plated steel, one piece, flat.

39 Sprinkler Guards:

40 Standard: UL 199.

41 Type: Wire cage with fastening device for attaching to sprinkler.

42 Alarm Devices

43
 44 Alarm-device types shall match piping and equipment connections.

45 Electrically Operated Alarm Bell:

46 Standard: UL 464.

47 Type: Vibrating, metal alarm bell.

48 Size: 8-inch minimum diameter.

1 Finish: Red-enamel factory finish, suitable for outdoor use.

2 Water-Flow Indicators:

3 Standard: UL 346.

4 Water-Flow Detector: Electrically supervised.

5 Components: Two single-pole, double-throw circuit switches for isolated alarm and
6 auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-
7 adjustable retard element to prevent false signals and tamperproof cover that sends
8 signal if removed.

9 Type: Paddle operated.

10 Pressure Rating: 250 psig.

11 Design Installation: Horizontal or vertical.

12 Pressure Switches:

13 Standard: UL 346.

14 Type: Electrically supervised water-flow switch with retard feature.

15 Components: Single-pole, double-throw switch with normally closed contacts.

16 Design Operation: Rising pressure signals water flow.

17 Valve Supervisory Switches:

18 Standard: UL 346.

19 Type: Electrically supervised.

20 Components: Single-pole, double-throw switch with normally closed contacts.

21 Design: Signals that controlled valve is in other than fully open position.

22 Indicator-Post Supervisory Switches:

23 Standard: UL 346.

24 Type: Electrically supervised.

25 Components: Single-pole, double-throw switch with normally closed contacts.

26 Design: Signals that controlled indicator-post valve is in other than fully open
27 position.

28 Manual Control Stations

29
30 Description: UL listed or FM approved, hydraulic operation, with union, NPS 1/2 pipe nipple,
31 and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION" with
32 operating instructions and cover held closed by breakable strut to prevent accidental opening.
33

34 Control Panels

35
36 Description: Single-area, two-area, or single-area cross-zoned control panel as indicated,
37 including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for
38 operation of deluge valves. Panels contain power supply; battery charger; standby batteries;
39 field-wiring terminal strip; electrically supervised solenoid valves and polarized fire-alarm bell;
40 lamp test facility; single-pole, double-throw auxiliary alarm contacts; and rectifier.

41 Panels: UL listed and FM approved when used with thermal detectors and Class A
42 detector circuit wiring. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc
43 rechargeable batteries.

44 Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL
45 CONTROL STATION" with operating instructions and cover held closed by breakable
46 strut to prevent accidental opening.
47
48

Pressure Gages

Standard: UL 393.

Dial Size: 3-1/2- to 4-1/2-inch diameter.

Pressure Gage Range: 0 to 250 psig minimum.

Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

EXECUTION

Preparation

Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

Report test results promptly and in writing.

Service-Entrance Piping

Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

Piping Installation

Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

Install unions adjacent to each valve in pipes NPS 2 and smaller.

Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

Install sprinkler piping with drains for complete system drainage.

Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

Install alarm devices in piping systems.

Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal

1 seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit
2 removal, and install where they will not be subject to freezing.

3 Fill sprinkler system piping with water.

4 Install sleeves for piping penetrations of walls, ceilings, and floors.

5 Install sleeve seals for piping penetrations of concrete walls and slabs.

6 Install escutcheons for piping penetrations of walls, ceilings, and floors.

7 8 Joint Construction

9 Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that
10 have finish and pressure ratings same as or higher than system's pressure rating for
11 aboveground applications unless otherwise indicated.

12 Install unions adjacent to each valve in pipes NPS 2 and smaller.

13 Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and
14 equipment having NPS 2-1/2 and larger end connections.

15 Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

16 Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before
17 assembly.

18 Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water
19 service. Join flanges with gasket and bolts according to ASME B31.9.

20 Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut
21 threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore
22 full ID. Join pipe fittings and valves as follows:

23
24 Apply appropriate tape or thread compound to external pipe threads.

25 Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or
26 damaged.

27 Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes
28 and welding operators according to "Quality Assurance" Article.

29
30 Shop weld pipe joints where welded piping is indicated. Do not use welded joints for
31 galvanized-steel pipe.

32 Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to
33 AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and
34 grooved-end fittings according to AWWA C606 for steel-pipe joints.

35 Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to
36 AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and
37 grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

38 Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both
39 piping systems.

40 41 Valve And Specialties Installation

42 Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and
43 specialties according to NFPA 13 and authorities having jurisdiction.

44 Install listed fire-protection shutoff valves supervised open, located to control sources of water
45 supply except from fire-department connections. Install permanent identification signs
46 indicating portion of system controlled by each valve.

47 Install check valve in each water-supply connection. Install backflow preventers instead of
48 check valves in potable-water-supply sources.

1 Specialty Valves:

2 General Requirements: Install in vertical position for proper direction of flow, in main
3 supply to system.

4 Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.
5

6 Sprinkler Installation

7 Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling
8 panels.

9 Install dry-type sprinklers with water supply from heated space. Do not install pendent or
10 sidewall, wet-type sprinklers in areas subject to freezing.

11 Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.
12

13 Fire-Department Connection Installation

14 Install yard-type, fire-department connections in concrete slab support.

15 Install automatic (ball drip) drain valve at each check valve for fire-department connection.
16

17 Identification

18 Install labeling and pipe markers on equipment and piping according to requirements in
19 NFPA 13.

20 Identify system components, wiring, cabling, and terminals. Comply with requirements for
21 identification specified in Division 26 Section "Identification for Electrical Systems."
22

23 Field Quality Control

24 Perform tests and inspections.

25 Tests and Inspections:

26 Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest
27 until no leaks exist.

28 Test and adjust controls and safeties. Replace damaged and malfunctioning controls
29 and equipment.

30 Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance"
31 Chapter.

32 Energize circuits to electrical equipment and devices.

33 Start and run excess-pressure pumps.

34 Coordinate with fire-alarm tests. Operate as required.

35 Verify that equipment hose threads are same as local fire-department equipment.

36 Sprinkler piping system will be considered defective if it does not pass tests and inspections.

37 Prepare test and inspection reports.
38

39 Cleaning

40 Clean dirt and debris from sprinklers.

41 Remove and replace sprinklers with paint other than factory finish.
42

43 Demonstration

44 Engage a factory-authorized service representative to train Owner's maintenance personnel to
45 adjust, operate, and maintain specialty valves.
46
47
48

1 Piping Schedule

2 Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight
3 steel pipe with threaded ends; cast-iron threaded fittings.

4 Sprinkler specialty fittings may be used, downstream of control, instead of specified fittings.

5

6 Sprinkler Schedule

7 Use sprinkler types in subparagraphs below for the following applications:

8 Rooms without Ceilings: Upright sprinklers.

9 Rooms with Suspended Ceilings: Recessed sprinklers.

10 Wall Mounting: Sidewall sprinklers.

11 Spaces Subject to Freezing: Upright sprinklers.

12 Provide sprinkler types in subparagraphs below with finishes indicated.

13 Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

14 Upright Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough
15 bronze in unfinished spaces not exposed to view.

16

17 END OF SECTION

1 SECTION 22 0100 - PLUMBING GENERAL PROVISIONS

2
3 GENERAL

4
5 Related Documents

6 The General Conditions, Special Conditions and Contract Documents are part of these specifications.
7 Consult them further instructions and be governed by the requirements thereunder.

8
9 Description

10
11 Work Included

12 Furnish all labor and materials and perform all operations necessary for the installation of
13 complete and operating mechanical systems subject to the conditions of the contract. The work
14 also includes the completion of such mechanical and electrical details not mentioned or shown
15 which are necessary for the successful operation of all systems; this includes the furnishing of all
16 materials for filling systems to make them operable, including water, refrigerant, oil, grease,
17 antifreeze and brine. Prove satisfactory operation of all equipment and controls to the
18 MECHANICAL ENGINEER on request.

19 Work Not Included

20 Certain labor and materials may be furnished and/or installed under other divisions of these
21 specifications. Coordinate with other trades and arrange the work to make the parts fit
22 together. The following items are to be accomplished under other divisions of these
23 specifications.

24 Temporary Heat: See Paragraph 1.7, this Section and Division 01.

25 Roof Curbs: See Paragraph 3.9, this Section.

26 Concrete: See paragraph 3.10, this Section.

27 Electrical Equipment and Wiring: See paragraph 3.11, this section.

28 Temporary Water and Toilet: See Division 01.

29
30 Equipment Furnished by Owner

31 The Owner may award contracts, which may commence concurrently with this contract.

32 Specifically this work will include:

33 Equipment Installation: Refer to appropriate drawings for equipment furnished by the
34 Owner and/or Specifications.

35
36 Provisions

37 Work performed under this division of the specifications shall conform to the requirements of Division
38 01, and the mechanical drawings and all items hereinafter specified.

39 Prior to any work being performed under this division, examine architectural, structural, food
40 service, civil, electrical, specialty systems, and interior design drawings and specifications. If any
41 discrepancies occur between them and the mechanical drawings and specifications, report
42 discrepancies to the Architect in writing and obtain written instructions for the work.

43 Mechanical drawings are diagrammatic, but shall be followed as closely as actual construction of
44 the building will permit. All changes from drawings necessary to make the mechanical work
45 conform to the building as constructed shall be made without additional cost to the Owner.
46 Coordinate the mechanical work with the General Contractor and be responsible to him for
47 satisfactory progress of the work. Coordinate mechanical work with all other trades on the
48 project without additional cost to the Owner.

1 All work and materials covered by drawings and specifications shall be subject to review at any
2 time by representatives of the Architect and Owner. If the Architect or Owner's agent finds any
3 materials or installation that does not conform to these drawings and specifications, Contractor
4 shall remove the material from the premises and correct the installation to the satisfaction of
5 the agent.

6 In acceptance or rejection of installed mechanical systems, no allowance will be made for lack of
7 skill on the part of the installers.
8

9 Examination Of Premises/Site

10 Visit the premises site before submitting bid as no extras will be allowed for lack of knowledge of
11 existing conditions.
12

13 Codes And Standards

14 Conform to applicable sections of NFPA 13 and 24.

15 Conform to the National Electrical Code, 1999 Edition.

16 Conform to New Mexico Department of Health "Rules and Regulations Governing Schools in the State of
17 New Mexico".

18 Conform to all applicable State and Local Codes.

19 In case of difference between these specifications, codes, laws, industry standards, and/or utility
20 company regulations the most stringent shall govern.

21 Americans with Disabilities Acts (ADA) and American National Standards Institute (ANSI) 117.
22

23 Permits, Fees And Notices

24 Apply for and pay for all permits, fees, licenses and inspections for this Division of work.

25 Do not include the cost of any "Plant Investment Fee" or "System Development Charge" for
26 sewer and/or water charged by the City. This will be arranged for and paid for by the Owner.

27 Do not include the cost of any "Gas Application Fee" charged by the Utility Company. This will
28 be arranged and paid for by the Owner.

29 Notify proper authorities when work is ready for inspections required by applicable codes, rules and
30 regulations, allowing sufficient time for inspections to be made without hindering progress of the work.

31 Furnish to the Owner copies of inspection certificates of acceptance.
32

33 Temporary Heat

34 Temporary heat will be furnished by the General Contractor. Use of the permanent heating system will
35 not be allowed without written authorization from the Owner. In case the permanent heating system is
36 used for temporary heat, the Owner shall pay all costs.
37

38 Existing Utilities

39 The plans indicate the location, type and sizes of various utilities within the site where known. These
40 utilities are indicated as accurately as possible. If utilities are encountered during construction, which
41 are not shown on the drawings, ask for instructions from the Architect. Any relocation or remodeling
42 required will then be directed by change order. Assume all responsibility for protection of all utilities,
43 shown or not, and repair any damage caused by this construction at no extra charge to the Owner.

44 Investigate with proper authorities for all existing water taps, etc. and make arrangements to pay for all
45 removal charges in original bid.

46 Owner of all underground utilities shall be notified at least 2 business days prior to excavation so that
47 they can locate and mark underground facilities.

1 Drawings

2 Mechanical drawings are diagrammatic and are not to be scaled for dimensions. Take all dimensions
3 from Architectural drawings, certified equipment drawings, and from the structure itself before
4 fabricating any work. Verify all space requirements, coordinating with other trades, and install the
5 systems in the space provided without extra charges to the Owner.
6 Conceal all piping in finished areas of the building except where otherwise noted on the drawings.
7 Install all equipment in accordance with manufacturer's recommendations, unless approval is given in
8 writing by the MECHANICAL ENGINEER for deviation.

9
10 Examination Of Bidding Documents

11 Each bidder shall examine the bidding documents carefully, and not later than seven days prior to the
12 date of receipt of bids, shall make written request to the Architect for interpretation or correction of any
13 discrepancies, ambiguity, inconsistency, or error therein which he may discover. Any interpretation or
14 correction will be issued as an addendum by the Architect. Only a written interpretation or correction
15 by addendum shall be binding. No bidder shall rely upon interpretations or corrections given by any
16 other method. If discrepancies, ambiguity, inconsistency, or error are not covered by addendum or
17 written directive, Contractor shall include in his bid, labor materials and methods of construction
18 resulting in higher cost. After award of contract, no allowance or extra compensation will be made on
19 behalf of the Contractor due to his failure to make the written requests as described above.
20 The person submitting the request will be responsible for its prompt delivery. Failure to so request
21 clarification of any inadequacy, omission, or conflict will not relieve the Contractor of responsibility. The
22 signing of the Contract will be considered as implicitly denoting that the Contractor has a thorough
23 comprehension of full intent and scope of the working drawings and specifications.

24
25 Rough-In

26 Verify final locations for rough-ins with field measurements and with the requirements of the actual
27 equipment.
28 Refer to equipment specifications in Divisions 01 thru 21 and 23 thru 33 for additional rough-in
29 requirements.

30
31 Coordination Drawings

32 Prepare and submit a set of ~~three~~ two dimensional coordination drawings showing major elements,
33 components, and systems of mechanical equipment and materials in relationship with other building
34 components. Prepare drawings to an accurate scale of ¼"=1'-0" or larger. Indicate the locations of all
35 equipment and materials, including clearances for servicing and maintaining equipment. Indicate
36 movement and positioning of large equipment into the building during construction.
37 Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate
38 where space is limited, and where sequencing and coordination of installations are of importance to the
39 efficient flow of the Work layouts should Include (but not necessary limited) to the following for
40 coordination:

- 41 Ductwork
- 42 Hydronic Piping
- 43 Plumbing Piping
- 44 Fire sprinkler piping
- 45 Electrical conduit mains

46
47 Mechanical Installations

48 Coordinate Plumbing equipment and Piping installation with other building components.

- 1 Verify all dimensions by field measurements.
2 Arrange for chases, slots, and openings in other building components to allow for plumbing and piping
3 installations.
4 Coordinate the installation of required supporting devices and sleeves to be set in poured in place
5 concrete and other structural components, as they are constructed.
6 Sequence, coordinate, and integrate installations of Plumbing materials and equipment for efficient flow
7 of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the
8 building.
9 Coordinate the cutting and patching of building components to accommodate the installation of the
10 work.
11 Where mounting heights are not detailed or dimensioned, install mechanical services and overhead
12 equipment to provide the maximum headroom possible, and in accordance with minimum required
13 clearances as specified in codes and regulations.
14 The word "concealed" as used in this specification refers to such spaces as pipe and duct chases, pipe
15 and duct trenches, above plastered ceilings, in walls and buried where pipe and/or duct is inaccessible
16 when building is complete. "Exposed" is intended to be within equipment rooms, unfinished areas,
17 above "push up" ceilings, accessible pipe and duct tunnels.
18 The term "furnish" means supply and deliver to Project, unless otherwise defined in greater detail. The
19 term "install" is used to describe operations at Project, from inspecting and unloading, to completion in
20 place, ready for intended use. The term "provide" means furnish and install, complete and ready for
21 intended use, unless otherwise defined in greater detail.

- 22
23 Submittals
24 Submit under provisions of Division 01.
25 Proposed Product List: Include Products specified in Division 22 specifications.
26 Submit shop drawings and product data grouped to include complete submittals of related systems,
27 Products, and accessories in a single submittal.
28 Mark dimensions and values in units to match those specified.
29 Submit miscellaneous items specified on the drawings, but not covered in the specifications. Make no
30 substitutions without prior approval from the Architect.

- 31
32 Shop Drawings
33 Submit shop drawings on all equipment, Temperature Controls and Fire Protection. Provide shop
34 drawings to the Architect and Engineer showing locations of all access panels.
35 Shop drawings required for section 22 work include (but not necessarily limited to) the following:
36 Plumbing fixtures
37 Insulation
38 Pumps
39 Heat Exchangers
40 Hangers and Supports
41 Valves, Meters, Gages
42 Expansion fittings
43 Piping
44 Motor Starters
45 Water Heaters
46 Present shop drawing submittal data at one time, bound in three-ring binders, indexed in a neat and
47 orderly manner. Partial submittals will not be accepted. Provide five sets of submittal data, unless
48 noted otherwise in Division 01. Do not begin work until one (1) copy is returned.

1 Provide, with shop drawing submittal, 1/4" scale layout drawings of equipment rooms. Layouts shall
2 show locations of, equipment, piping, clearances ex, and shall be coordinated with electrical equipment,
3 and equipment shall be drawn to scale.

4 Place orders for all equipment in time to prevent any delay in construction schedule or completion of
5 project. If any materials or equipment are not ordered in time, additional charges made by equipment
6 manufacturers to complete their equipment in time to meet construction schedule, together with any
7 special handling charges, shall be borne by the Contractor.

8 Contractor agrees that shop drawing submittals processed by the engineer are not change orders. The
9 purpose of shop drawing submittals by the Contractor is to demonstrate to the engineer that the
10 Contractor understands the design concept, that he demonstrates his understanding by indicating which
11 equipment and material he intends to furnish and install and by detailing the fabrication and installation
12 methods he intends to use. Contractor further agrees that if deviations, discrepancies, or conflicts
13 between shop drawing submittals and contract documents in the form of design drawings and
14 specifications are discovered either prior to or after shop drawings and specifications shall control and
15 shall be followed.

16 Contractor to provide manufacturers' recommended installation manuals for equipment.

17 Review of shop drawings does not relieve this Contractor from the responsibility of furnishing
18 equipment and materials of proper dimension, size, quantity, quality and all performance characteristics
19 to efficiently perform the requirements and intent of the contract documents. Review does not relieve
20 this Contractor from responsibility for errors on the shop drawings. If the shop drawings deviate from
21 the contract documents, advise the MECHANICAL ENGINEER of the deviations in writing accompanying
22 the shop drawings, including the reasons for the deviations. Coordinate all required changes with the
23 other trades affected. If the changes are occasioned by the Contractor, he shall pay any costs involved.
24

25 Project/Site Conditions

26 Install Work in locations shown on Drawings, unless prevented by Project conditions.

27 Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including
28 changes to Work specified in other sections. Obtain permission of Architect before proceeding.
29

30 Project Record Drawings

31 During the process of the work, maintain an accurate record of the installation of the mechanical
32 systems. Upon completion of the mechanical systems installation, transfer all record data to blue-line
33 prints of the original drawings. Drawings shall include all addendum items, charge orders, alternations,
34 reroutings, etc. As a condition of acceptance of the project, deliver to the Architect one copy of the
35 record drawings.
36

37 Warranty

38 All materials and equipment shall be new unless otherwise specified.

39 Guarantee all workmanship, materials and equipment and replace any found defective without cost to
40 the Owner, for one year after final acceptance, as defined in General Conditions.

41 Each warranty for longer than the one year described above (that comes with equipment used on the
42 job) shall be passed on to the owner with dates of start and end of the warranty.
43

44 Engineering By Contractor

45 The construction of this building requires the contractor to design several systems or subsystems. All
46 such design shall be the completed responsibility of the contractor.

47 Systems or subsystems which require engineering responsibility by the contractor include, but are not
48 limited to:

- 1 Equipment supports, not fully detailed in the drawings.
- 2 Pipe hangers and anchors not specified in these documents, or catalogued by the manufacturer.
- 3 Water treatment.
- 4 Seismic restraints.

5

6 PRODUCTS

7

8 Equipment Manufacturer

9 Equipment in the following categories shall be of one manufacturer or available through one
10 manufacturer for each category to facilitate ease of maintenance for the Owner.

11 Motors (open drip-proof squirrel cage)

12 Starters

13 Booster Pumps

14 Single Suction Pumps

15 Double Suction Pumps

16 Temperature Controls

17 Plumbing Fixture Trim

18 Thermometers

19 Pressure Gauges

20 Gate Valves

21 Butterfly Valves

22 Plug Valves

23 Globe Valves

24 Check Valves

25 Balancing Valves

26 Radiator Valves

27 Traps

28 Dielectric Unions

29 Strainers

30 Air Filters

31

32 SUBSTITUTIONS (PRIOR APPROVALS, During The Bid Phase)

33

34 Bidder's Choice

35 Materials, equipment or services listed by several identifying names are intended to be bidder's
36 choice, and any of the listed names may be bid without soliciting prior acceptance. Where more
37 than one name is given in the specifications, the manufacturer's material, equipment or services
38 scheduled on the drawings is contemplated and any changes and their costs, required to
39 accommodate the other named material or equipment as well as space requirements for the
40 other named materials or equipment, must be assumed by the Contractor in his bid. (See Shop
41 Drawing Requirement).

42

43 Performance Specification

44 When any product is specified only by requirement to meet an industry standard or regulating
45 body standard (such as U.L., AGA, AWWA, ANSI, etc.) and the item proposed carries approval of
46 that body, no prior acceptance by the MECHANICAL ENGINEER is needed.

1 When any product or service is specified by requirement to meet a performance standard or is
2 specified by a generic specification, (no manufacturers name listed) no prior acceptance by the
3 MECHANICAL ENGINEER is needed except as specifically called for in these specifications.
4

5 Acceptance

6 Material and equipment specified is used as a basis of standard, and while not specifically
7 mentioned, material gauges, weights, appearance and space requirements must be met by any
8 substitutions.

9 Action for substitutions specified herein will be given only after the receipt of complete data
10 showing performance over entire range, physical dimensions and material construction all
11 SPECIFICALLY marked for the individual item. Letter of transmittal with at least one (1) copy and
12 one (1) marked up copy of all descriptive data shall be submitted to the MECHANICAL
13 ENGINEER'S Office.

14 Submit shop drawings for all materials and equipment other than the first named in these
15 specifications showing any changes required in piping, ducting, electrical wiring, space allocation
16 etc. Be responsible to make all changes required to accommodate and to pay for these changes.
17 Coordinate changes required with all other trades. Pay for all changes resulting from re-
18 arranging equipment.

19 See General Conditions for method of notification of acceptance.
20

21 Substitutions (Contractor And/Or Owner Initiated)

22 Materials or equipment listed by several manufacturers' names are intended to be bidder's choice, and
23 any of the listed manufacturers may be used in the base bid. Materials or equipment not listed are
24 considered substitutions.

25 Performance Specification: When any item is specified by requirement to meet a performance, industry
26 or regulating body standard or is specified by a generic spec, (no manufacturer's name listed) no prior
27 approval by the Consulting Mechanical Engineer is needed unless specifically called for in these
28 specifications.

29 Contractor to be responsible for any changes and costs, including design costs, to accommodate any
30 equipment except the first named in the specification.

31 Substitutions for Material

32 Systems, equipment, and materials not listed as equivalents may be proposed as deductive
33 alternates to specified items by submitting them as a separate line item to the base bid on the
34 Bidder's letterhead.

35 Such deductive alternate proposals shall not be substituted for the base bid systems,
36 equipment, and materials. Deductive alternate proposals must be accompanied by full
37 descriptive data on the proposed equipment with a statement of the cost to be deducted for
38 each item and all deviations from specified items. Highlight all difference from specified
39 equipment. If the Owner elects to consider such deductive alternates, the Contractor shall
40 submit a list of the proposed deductive alternate substitution items within 14 days of award of
41 contract. Late requests for proposed substitutions due to scheduling or delivery concerns will
42 not be accepted by the Engineer.
43

44 Bid Alternate(S)

45 Refer to Division 01 and all contract documents for additional information.
46
47
48

1 Alternate(s) for Material and Equipment

2 Equipment and material bid alternate(s) shall be proposed as additive or deductive alternate(s)
3 to specified items by submitting it as a separate line item from the base bid on the Bidder's
4 letterhead.

5 Such bid alternate proposals shall not be substituted or included in the base bid. Bid alternate
6 proposal(s) must be accompanied by full descriptive data on the proposed equipment, together
7 with a statement of the cost to be added or deducted for each item. The bid alternate shall
8 include all materials, equipment, labor, electrical connections, coordination with all other
9 trades, etc. for a complete and operational system.

10 The Contractor shall submit the bid alternates at the time the base bids are due.

11
12 EXECUTION

13
14 Storage

15 Provide for proper storage of all materials and equipment and assume responsibility for losses due to
16 any cause. All storage shall be within the contact limit lines of the building site. Cover and store all
17 equipment and materials out of elements; any rusted or weather damaged item shall not be used.

18
19 Product Installation

20
21 Manufacturer's Instructions

22 Except where more stringent requirements are indicated, comply with the product
23 manufacturer's instructions and recommendations.

24 Consult with manufacturer's technical representatives, who are recognized as technical experts,
25 for specific instructions on special project conditions.

26 If a conflict exists, notify the Architect/Engineer in writing and obtain his instruction before
27 proceeding with the work in question.

28
29 Movement of Equipment

30 Wherever possible, arrange for the movement and positioning of equipment so that enclosing
31 partitions, walls and roofs will not be delayed or need to be removed.

32 Otherwise, advise Contractor of opening requirements to be maintained for the subsequent
33 entry of equipment.

34
35 Heavy Equipment

36 Coordinate the movement of heavy items with shoring and bracing so that the building structure
37 will not be overloaded during the movement and installation.

38 Return Air Path: Coordinate mechanical work in return air plenum to avoid obstructing return air path.

39 Do not make changes in layout which will reduce return air path cross-sectional areas.

40 Minimum cross-sectional area will provide a maximum of 500 fpm velocity through return air
41 plenum at specified supply air quantity unless otherwise noted.

42 Report any obstructions by work of other Divisions to Architect/Engineer.

43
44 Clearances

45 Install piping and ductwork:

46 Straight and true.

47 Aligned with other work.

48 Close to walls and overhead structure (allowing for insulation).

1 Concealed, where possible, in occupied spaces.
 2 Out-of-the-way with maximum passageway and headroom remaining in each space.
 3 Except as otherwise indicated, arrange mechanical services and overhead equipment with a
 4 minimum of:
 5 7'0" headroom in storage spaces.
 6 8'6" headroom in other spaces.
 7 Do not obstruct windows, doors or other openings.
 8 Give the right-of way to piping systems required to slope for drainage (over other service lines
 9 and ductwork).
 10 Offsets, transitions and changes in direction in pipes and ducts shall be made as required to
 11 maintain proper head room and pitch of sloping pipes whether or not indicated on the
 12 drawings. Furnish and install all traps, air vents, sanitary vents, etc., as required to affect these
 13 offsets, transitions and changes in direction.

14
15 Access

16 Install all work to permit removal (without damage to other parts) of coils, heat exchanger
 17 bundles, boiler tubes, fan shafts and wheels, filters, belt guards, sheaves and drives, and all
 18 other parts which might require periodic replacement or maintenance. Arrange pipes, ducts,
 19 and equipment to permit ready access to valves, traps, starters, motors, control components
 20 and to clear the openings of doors and of access panels.

21
22 Protection Of Work And Property

23 Where there are existing facilities, be responsible for the protection thereof, whether or not such facility
 24 is to be removed or relocated. Moving or removing any facility must be done so as not to cause
 25 interruption of the work of Owner's operation.

26 Close all pipe with caps or plugs during installation. Cover all fixtures and equipment and protect
 27 against injury. At the final completion, clean all work and deliver in an unblemished condition, or
 28 refinish and repaint at the discretion of the Architect.

29 Any equipment, duct or piping systems found to have been damaged or contaminated above "MILL" or
 30 "SHOP" conditions shall be replaced or cleaned to the Engineer's satisfaction.

31 Initial fill of traps

32 Provide initial water seal fill for all waste p-traps, condensate traps, or similar traps.

33
34 Protection Of Potable Water Systems

35 All temporary water connections shall be made with an approved back flow preventer.

36 All hose bibbs shall have, as a minimum, a vacuum breaker to prevent back flow.

37 Direct connections to hydronic systems shall only be made through a reduced pressure back flow
 38 preventer.

39
40 Protection Of Systems Serving Occupied Spaces

41 Where work is being performed in occupied spaces, or occupancy is to be phased in with ongoing
 42 construction contractor shall prevent contamination of all systems serving the occupants including but
 43 not limited to:

44
45 Domestic Water

46 solate sterilized portions from non-sterilized portions.

1 Demonstration
 2 Refer to Division 1 sections of the specifications regarding requirements of Record Drawings and
 3 Operation and maintenance Manual submittal and systems demonstration.
 4 Demonstrate that each system operates properly.
 5 Explain the operation of each system to the Owner’s Representative. Explain use of O&M
 6 manual in operating and maintaining systems.
 7 Date and time of demonstration will be determined by the Owner.
 8
 9

10 Roof Curbs
 11 Roof curbs and roof flashings for all equipment located on the roof shall be furnished under the
 12 Architectural Division (except for any sound curbs or roof top units' integral curbs specified herein).
 13 Furnish and install all counter flashing of the same material as the flashing.
 14

15 Concrete
 16 All poured in place concrete shall be furnished under the Architectural Divisions of these Specifications.
 17 This Contractor shall coordinate all requirements for concrete surrounding buried duct. Ducts shall be
 18 tied down to concrete deadman and completely surrounded with 3" of concrete.
 19

20 Electrical Equipment And Wiring For Mechanical Division
 21 Unless otherwise indicated, all motors and controls shall be furnished, set in place and wired in
 22 accordance with the following schedule. (MD is Mechanical Division - ED is Electrical Division).
 23

ITEM	FURNISHED UNDER	SET IN PLACE OR MOUNTED UNDER	WIRED AND CONNECTED UNDER
Equipment Motors and Thermal overloads, resistance heaters (c).	MD	MD	ED
Motor Controllers; magnetic starters, reduced voltage starters and overload relays.	ED	ED(a)	ED
Disconnect switches, fused or unfused, H.P. rated switches, thermal overload switches and fuses, manual operating switches.	ED(a)	ED(a)	ED
Push-button stations, pilot lights, multi-speed switches, float switches, thermostats, control relays, time clocks, control transformers, control panels, motor valves, damper motors, solenoid valves, EP and PE switches and interlocks.	MD	MD(b)	MD(b)

<p>Contactors, 120V control circuit outlets for control panels and for boiler controls and for fire protection controls and smoke detectors.</p>	MD	ED	ED
<p>Duct Detectors, fire/smoke dampers, elevator vent dampers.</p>	MD	MD	ED(c)

1 If furnished as part of factory wired equipment, wiring and connections only by ED.
 2 If float switches, line thermostats, P.E. switches, time switches, etc., carry the FULL
 3 LOAD CURRENT to any motor, they shall be furnished by the Mechanical Division, but
 4 shall be set in place and connected under the Electrical Division, except that where such
 5 items are no integral part of the mechanical equipment, or directly attached to ducts,
 6 piping, etc., they shall be set in place under the Mechanical Division and connected by
 7 the Electrical Division. If they do not carry the FULL LOAD CURRENT to any motor they
 8 shall be furnished, set in place and wired under the Mechanical Division. Control
 9 devices carrying full load current furnished by Mechanical and wired by Electrical shall
 10 be located at the device being controlled, unless shown on drawings or mutual
 11 agreement is made between the contractors with no change in the contract price.
 12 Wiring from alarm contacts to alarm system by Ed; all control function wiring by MD.
 13 The above list does not attempt to include all components. All items necessary for a
 14 complete system shall be included in the base contract.

15 Connections to all controls directly attached to ducts, piping and mechanical equipment shall be made
 16 with flexible connectors.

17
 18 Identification

19
 20 Piping

21 All exposed piping, except piping in finished spaces, shall be identified in conformance with
 22 "Scheme for the Identification of Piping Systems", ANSI A13. All markers must be in compliance
 23 with respect to (1) proper letter color, (2) proper letter size, (3) correct background color, and
 24 (4) proper marker length.
 25 Directional flow arrows shall be applied adjacent to each pipe mark.
 26 For pipes under 3/4" O.D. color coded (as described above) identification tags shall be securely
 27 fastened at all required locations. Tags shall be 1-1/2 inches in diameter.
 28 All piping shall be marked at the following locations: (1) next to each valve and fitting, (2) at
 29 each branch and riser take-off, (3) at each wall, ceiling or floor penetration, (4) on pipes that
 30 lead to and from underground areas, and (5) every 30 feet on horizontal and vertical pipe runs.
 31 Identification of all piping systems shall conform to the designations in the mechanical legend
 32 on the drawings.

33
 34 Valves

35 All valves shall be identified by color coded (to match piping system identification) tags which
 36 indicate both service and number. Tags shall be 1-1/2 inch in diameter and have 1/4 inch high
 37 letters to indicate service and 7/16 inch high numbers. Tags shall be securely fastened to all
 38 valves. Service designations shall match abbreviations for piping systems given in mechanical
 39 legend on the drawings. Valve charts shall be provided and shall include (1) valve identification

1 number, (2) service, (3) location, and (4) purpose. Valve charts shall be mounted in metal frame
2 with glass enclosure. One valve chart shall be secured on a wall in the boiler room. A second
3 valve chart shall be delivered to the Owner's authorized representative. Also a copy of the valve
4 chart shall be included in the Operations and Maintenance Instructions.

5 All electric controls, starters, pumps, and all other equipment and controls shall be identified by stencil
6 or permanent labeling.

7 Care shall be taken not to paint over nameplates.

8

9 Flushing, Cleaning & Sterilizing

10

11 **Intent:** It is the intent of this specification to require that all work, including the inside of equipment, be
12 left in a clean condition with all dust, grease, and construction debris removed.

13 Piping and connection equipment to be left free of sediments, core sand, grease, etc.

14 Clean all exposed surfaces of piping, ducts and hangers, etc., sufficiently to receive paint.

15 Remove and clean all screens, interceptors, strainers, etc., in piping systems just prior to
16 substantial completion.

17 Clean and wipe dry all plumbing fixtures, exposed valves, faucets, and piping, etc. that are

18 exposed just prior to substantial completion. Clean all equipment and fixtures per

19 manufacturer's specifications to avoid scratching finished surfaces. Leave all plumbing fixtures
20 ready to use.

21 Thoroughly clean all equipment room floors after completion of equipment, and pipe. A
22 condition of final acceptance will be the cleanliness of all exposed systems, equipment, and
23 equipment rooms.

24 Before final connections are made in the piping systems, blow out all piping with air and then wash out
25 with cleaning compounds. Then flush the system to remove of all foreign materials. Furnish all
26 temporary connections, valves, etc, required for this purpose. Clean the boiler and chiller by the same
27 procedure.

28 After flushing, sterilize the domestic water system in accordance with Section 221116.

29

30 Testing

31 Test all drain and waste lines with standing water test of twelve feet of head, held long enough to
32 visually inspect each joint.

33 Test all steam, condensate, heating water, domestic water piping, and chilled water piping at 150 psig
34 hydrostatic pressure before connecting to unit.

35 Test all high pressure steam and condensate, domestic water service lines to PRV, fire lines, radiant
36 panel (embedded in concrete) and anti-freeze piping at 200 psig hydro static pressure.

37 Test all piping under 60 psig air pressure.

38 All tests must be done to the satisfaction of the local authorities having jurisdiction, before covering.

39 All hydrostatic tests to be held for a minimum of six hours without loss of pressure. Air tests to be held
40 for a minimum of two hours without loss of pressure.

41 Furnish all instruments required for testing.

42

43 Placing In Operation

44 Clean all pipes, equipment, controls etc., of plaster and other foreign debris.

45 Before final acceptance, clean or replace all strainers, oil or grease all bearings and clean out all drains.

46 Clean and recoat all permanent filters, replace throwaway type filters with new filters.

47 The systems shall be put into operation.

48 The Contractor shall verify that all controls are set to meet operating conditions specified.

- 1 Example: Boiler operating and limit controls set where specified.
2 The contractor shall verify that all pieces of equipment are operable and that all sequences of
3 control are being met.
4 The contractor to adjust settings through 1st year as required by MECHANICAL ENGINEER.
5

6 Balancing

7 The balancing of the system refer to Division 23 Testing Adjusting and Balancing
8

9 Operation And Maintenance Instructions

- 10 Books of Operating and Maintenance Instructions shall be personally delivered to the Owner's
11 authorized representative and the Owner instructed as to their use and the equipment involved.
12 (Provide two books for each building). Also, instruct the Owner's personnel on each valve and the valve
13 chart previously specified.
14 The book shall contain, but not be limited to, the following general items:
15 Spare parts lists for each piece of equipment.
16 Operating manuals for each piece of equipment and control.
17 Lubrication charts showing type of lubricant and application methods and frequencies.
18 Preventive maintenance schedule for checking all items such as belt drive, safety controls and
19 oil and refrigerant charges. Cleaning schedule of all strainers, traps, coils, tubes, tower pans,
20 sprays, etc. (On Contractor's letterhead stationary).
21 Normal operating instructions including a sequence of operation for each system. (On
22 Contractor's letterhead stationary).
23 Instructions as to procedure to be followed for any emergency situation, such as alarms or
24 safety items being tripped. (On Contractor's letterhead stationary).
25 Instructions on who to call for service during guarantee period. (On Contractor's letterhead
26 stationary).
27 Record of equipment installed (copy of each shop drawing as set forth under "Shop Drawing"
28 Paragraph).
29 All warranties provided by Manufacturers on their equipment that run longer than the one year
30 guarantee by the Contractor.
31 Books shall be arranged in sequence to match the equipment schedules included in the specifications.
32 Approval will not be given for final payment until the tests, balancing and operating instruction portions
33 have been completed.
34 Construction Waste Management: Construction Waste shall be managed in accordance with provisions
35 of Section 01 74 19 Construction Waste Management and disposal. Documentation shall be submitted
36 to satisfy the requirements of that section.
37

38 END OF SECTION

1 SECTION 22 0510 - BASIC PLUMBING MATERIALS AND METHODS

2
3 GENERAL

4
5 Summary

6 This Section includes the following:

7 Dielectric fittings.

8 Mechanical sleeve seals.

9 Sleeves.

10 Escutcheons.

11 Grout.

12 Mechanical demolition.

13 Equipment installation requirements common to equipment sections.

14 Concrete bases.

15 Supports and anchorages.

16
17 Submittals

18 Product Data: For the following:

19 Transition fittings.

20 Dielectric fittings.

21 Mechanical sleeve seals.

22 Escutcheons.

23
24 Quality Assurance

25 Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical
26 characteristics may be furnished provided such proposed equipment is approved in writing and
27 connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If
28 minimum energy ratings or efficiencies are specified, equipment shall comply with
29 requirements.

30
31 Delivery, Storage, And Handling

32 Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping,
33 storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and
34 moisture.

35 Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

36
37 Coordination

38 Arrange for pipe spaces, chases, slots, and openings in building structure during progress of
39 construction, to allow for mechanical installations.

40 Coordinate installation of required supporting devices and set sleeves in poured-in-place
41 concrete and other structural components as they are constructed.

42 Coordinate requirements for access panels and doors for mechanical items requiring access that
43 are concealed behind finished surfaces. Access panels and doors are specified in Division 08
44 Section "Access Doors and Frames."

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48

PRODUCTS

Manufacturers

In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

Transition Fittings

AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

Manufacturers:

JCM Industries.

Smith-Blair, Inc.

Viking Johnson.

Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.

Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.

Aboveground Pressure Piping: Pipe fitting.

Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

Manufacturers:

Eslon Thermoplastics.

Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

Manufacturers:

Thompson Plastics, Inc.

Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

Manufacturers:

NIBCO INC.

Flexible Transition Couplings for Underground Non-pressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

Manufacturers:

Cascade Waterworks Mfg. Co.

Fernco, Inc.

Mission Rubber Company.

Plastic Oddities, Inc.

Dielectric Fittings

Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

Insulating Material: Suitable for system fluid, pressure, and temperature.

Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

Manufacturers:

1 Hart Industries, International, Inc.
 2 Watts Industries, Inc.; Water Products Div.
 3 Zurn Industries, Inc.; Wilkins Div.

4 Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-
 5 psig minimum working pressure as required to suit system pressures.

6
 7 Manufacturers:

8 Capitol Manufacturing Co.
 9 Central Plastics Company.
 10 Epco Sales, Inc.
 11 Watts Industries, Inc.; Water Products Div.

12 Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face-
 13 or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic
 14 washers, and steel backing washers.

15 Manufacturers:

16 Advance Products & Systems, Inc.
 17 Calpico, Inc.
 18 Central Plastics Company.
 19 Pipeline Seal and Insulator, Inc.

20
 21 Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum
 22 working pressure where required to suit system pressures.

23 Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic
 24 lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

25 Manufacturers:

26 Calpico, Inc.
 27 Lochinvar Corp.

28 Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining;
 29 plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

30 Manufacturers:

31 Perfection Corp.
 32 Precision Plumbing Products, Inc.
 33 Sioux Chief Manufacturing Co., Inc.
 34 Victaulic Co. of America.

35
 36 Mechanical Sleeve Seals

37 Description: Modular sealing element unit, designed for field assembly, to fill annular space
 38 between pipe and sleeve.

39 Manufacturers:

40 Advance Products & Systems, Inc.
 41 Calpico, Inc.
 42 Metraflex Co.
 43 Pipeline Seal and Insulator, Inc.

44 Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and
 45 number required for pipe material and size of pipe.

46 Pressure Plates: Carbon steel. Include two for each sealing element.

47 Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to
 48 secure pressure plates to sealing elements. Include one for each sealing element.

Sleeves

Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

Under deck Clamp: Clamping ring with set screws.

Escutcheons

Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

One-Piece, Cast-Brass Type: With set screw.

Finish: Polished chrome-plated.

Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

Finish: Polished chrome-plated.

One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.

One-Piece, Floor-Plate Type: Cast-iron floor plate.

Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

Grout

Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.

Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

Design Mix: 5000-psi, 28-day compressive strength.

Packaging: Premixed and factory packaged.

EXECUTIONPiping Systems - Common Requirements

Install piping according to the following requirements and Division 22 Sections specifying piping systems.

Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

- 1 Install piping to permit valve servicing.
 2 Install piping at indicated slopes.
 3 Install piping free of sags and bends.
 4 Install fittings for changes in direction and branch connections.
 5 Install piping to allow application of insulation.
 6 Select system components with pressure rating equal to or greater than system operating
 7 pressure.
 8 Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 9 New Piping:
 10 Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 11 Insulated Piping: One-piece, stamped-steel type with spring clips.
 12 Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass
 13 type with polished chrome-plated finish.
 14 Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-
 15 brass type with polished chrome-plated finish.
 16 Bare Piping at Ceiling Penetrations in Finished Spaces: split casting, cast brass type with
 17 polished chrome-plated finish and set screw.
 18 Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished
 19 chrome-plated finish.
 20 Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
 21 Sleeves are not required for core-drilled holes valves noted otherwise.
 22 Permanent sleeves are not required for holes formed by removable PE sleeves.
 23 Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof
 24 slabs.
 25 Cut sleeves to length for mounting flush with both surfaces.
 26 Exception: Extend sleeves installed in floors of mechanical equipment areas or other
 27 wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below
 28 floor slab as required to secure clamping ring if ring is specified.
 29 Install sleeves in new walls and slabs as new walls and slabs are constructed.
 30 Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe
 31 insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to
 32 Division 07 Section "Joint Sealants" for materials and installation.
 33 Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical
 34 sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve
 35 for installing mechanical sleeve seals.
 36 Install steel pipe for sleeves smaller than 6 inches in diameter.
 37 Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 38 Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for
 39 pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and
 40 install in annular space between pipe and sleeve. Tighten bolts against pressure plates that
 41 cause sealing elements to expand and make watertight seal.
 42 Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal
 43 pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular
 44 clear space between pipe and sleeve for installing mechanical sleeve seals.
 45 Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for
 46 pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and
 47 install in annular space between pipe and sleeve. Tighten bolts against pressure plates that
 48 cause sealing elements to expand and make watertight seal.

1 Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors
 2 at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section
 3 "Through-Penetration Firestop Systems" for materials.

4 Verify final equipment locations for roughing-in.

5 Refer to equipment specifications in other Sections of these Specifications for roughing-in
 6 requirements.
 7

8 Piping Joint Construction

9 Join pipe and fittings according to the following requirements and Division 15 Sections
 10 specifying piping systems.

11 Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

12 Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

13 Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube
 14 end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-
 15 free solder alloy complying with ASTM B 32.

16 Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube"
 17 Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

18 Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut
 19 threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore
 20 full ID. Join pipe fittings and valves as follows:

21 Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is
 22 specified.

23 Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
 24 Do not use pipe sections that have cracked or open welds.

25 Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding
 26 operators according to Part 1 "Quality Assurance" Article.
 27

28 Piping Connections

29 Make connections according to the following, unless otherwise indicated:

30 Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each
 31 piece of equipment.

32 Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection
 33 to each piece of equipment.

34 Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar
 35 metals.

36 Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of
 37 dissimilar metals.
 38

39 Equipment Installation - Common Requirements

40 Install equipment to allow maximum possible headroom unless specific mounting heights are
 41 not indicated.

42 Install equipment level and plumb, parallel and perpendicular to other building systems and
 43 components in exposed interior spaces, unless otherwise indicated.

44 Install mechanical equipment to facilitate service, maintenance, and repair or replacement of
 45 components. Connect equipment for ease of disconnecting, with minimum interference to
 46 other installations. Extend grease fittings to accessible locations.

47 Install equipment to allow right of way for piping installed at required slope.

1 Concrete Bases

- 2 Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's
3 written instructions and according to seismic codes at Project.
4 Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both
5 directions than supported unit.
6 Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated,
7 install dowel rods on 18-inch centers around the full perimeter of the base.
8 Install epoxy-coated anchor bolts for supported equipment that extend through concrete base,
9 and anchor into structural concrete floor.
10 Place and secure anchorage devices. Use supported equipment manufacturer's setting
11 drawings, templates, diagrams, instructions, and directions furnished with items to be
12 embedded.
13 Install anchor bolts to elevations required for proper attachment to supported equipment.
14 Install anchor bolts according to anchor-bolt manufacturer's written instructions.
15 Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in
16 Division 03.

17
18 Erection Of Metal Supports And Anchorages

- 19 Refer to Division 05 Section "Metal Fabrications" for structural steel.
20 Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation
21 to support and anchor mechanical materials and equipment.
22 Field Welding: Comply with AWS D1.1.

23
24 Erection Of Wood Supports And Anchorages

- 25 Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor
26 mechanical materials and equipment.
27 Select fastener sizes that will not penetrate members if opposite side will be exposed to view or
28 will receive finish materials. Tighten connections between members. Install fasteners without
29 splitting wood members.
30 Attach to substrates as required to support applied loads.

31
32 Grouting

- 33 Mix and install grout for mechanical equipment base bearing surfaces, pump and other
34 equipment base plates, and anchors.
35 Clean surfaces that will come into contact with grout.
36 Provide forms as required for placement of grout.
37 Avoid air entrapment during placement of grout.
38 Place grout, completely filling equipment bases.
39 Place grout on concrete bases and provide smooth bearing surface for equipment.
40 Place grout around anchors.
41 Cure placed grout.

42
43 END OF SECTION

1 SECTION 22 0553 - PLUMBING IDENTIFICATION

2

3 GENERAL

4

5 SUMMARY

6 This Section includes the following mechanical identification materials and their installation:

- 7 Equipment markers.
- 8 Access panel and door markers.
- 9 Pipe markers.
- 10 Duct markers.
- 11 Stencils.
- 12 Valve tags.
- 13 Valve schedules.

14

15 SUBMITTALS

16

17 Product Data: For each type of product indicated.
18 Valve numbering scheme.

19

20 Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to
21 include in maintenance manuals.

22

23 COORDINATION

- 24 Coordinate installation of identifying devices with completion of covering and painting of surfaces where
25 devices are to be applied.
- 26 Coordinate installation of identifying devices with location of access panels and doors.
- 27 Install identifying devices before installing acoustical ceilings and similar concealment.

28

29 PRODUCTS

30

31 EQUIPMENT IDENTIFICATION DEVICES

32

33 Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent
34 adhesive.

35 Terminology: Match schedules as closely as possible.

36 Data:

- 37 Name and plan number.
- 38 Equipment service.
- 39 Design capacity.
- 40 Other design parameters such as pressure drop, entering and leaving conditions, and
41 speed.

42 Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for
43 equipment.

44 Access Panel and Door Markers: 1/16-inch-thick, engraved laminated plastic, with abbreviated
45 terms and numbers corresponding to identification. Provide 1/8-inch center hole for
46 attachment.

47 Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

1 PIPING IDENTIFICATION DEVICES

2 Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and
3 showing direction of flow.

4 Colors: Comply with ASME A13.1, unless otherwise indicated.

5 Lettering: Use piping system terms indicated and abbreviate only as necessary for each
6 application length.

7 Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360
8 degrees around pipe at each location.

9 Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe
10 markers at least three times letter height and of length required for label.

11 Arrows: Integral with piping system service lettering to accommodate both directions; or as
12 separate unit on each pipe marker to indicate direction of flow.

13

14 Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

15

16 Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-
17 type, self-adhesive back.

18 Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch
19 minimum.

20 Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches
21 minimum.

22

23 DUCT IDENTIFICATION DEVICES

24

25 Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and
26 duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

27

28 VALVE TAGS

29

30 Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch
31 numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.

32 Material: 0.032-inch- thick brass.

33 Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

34

35 VALVE SCHEDULES

36

37 Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping
38 system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-
39 operating position (open, closed, or modulating), and variations for identification. Mark valves for
40 emergency shutoff and similar special uses.

41 Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for
42 each page of valve schedule. Include mounting screws.

43 Frame: Extruded aluminum.

44 Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

45

46 WARNING TAGS

47

1 Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock
2 with matte finish suitable for writing.

3 Size: Approximately 4 by 7 inches.

4 Fasteners: Brass grommet and wire.

5 Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

6 Color: Yellow background with black lettering.
7

8 EXECUTION

9

10 APPLICATIONS, GENERAL

11 Install equipment markers with permanent adhesive on or near each major item of mechanical
12 equipment.

13 Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2
14 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater
15 viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal
16 lettering.

17 Data: Distinguish among multiple units, indicate operational requirements, indicate safety and
18 emergency precautions, warn of hazards and improper operations, and identify units.

19 Locate markers where accessible and visible. Include markers for the following general
20 categories of equipment:

21 Main control and operating valves, including safety devices and hazardous units such as
22 gas outlets.

23 Fire department hose valves and hose stations.

24 Meters, gages, thermometers, and similar units.

25 Pumps, compressors, chillers, condensers, and similar motor-driven units.

26 Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar
27 equipment.

28 Fans, blowers, primary balancing dampers, and mixing boxes.

29 Packaged HVAC central-station and zone-type units.

30 Tanks and pressure vessels.

31 Install access panel markers with screws on equipment access panels.
32

33 PIPING IDENTIFICATION

34 Install manufactured pipe markers indicating service on each piping system. Install with flow indication
35 arrows showing direction of flow.
36

37 Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-
38 coded, self-adhesive plastic tape, at least 3/4 inch 1-1/2 inches wide, lapped at least 1-1/2 inches
39 at both ends of pipe marker, and covering full circumference of pipe.
40

41 Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-
42 coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends
43 of pipe marker, and covering full circumference of pipe.

44 Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms;
45 accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed
46 locations as follows:

47 Near each valve and control device.

- 1 Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where
- 2 flow pattern is not obvious, mark each pipe at branch.
- 3 Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
- 4 At access doors, manholes, and similar access points that permit view of concealed piping.
- 5 Near major equipment items and other points of origination and termination.
- 6 Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of
- 7 congested piping and equipment.
- 8 On piping above removable acoustical ceilings. Omit intermediately spaced markers.

9

10 VALVE-TAG INSTALLATION

- 11 Install tags on valves and control devices in piping systems, except check valves; valves within factory-
- 12 fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and
- 13 lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-
- 14 use fixtures and units. List tagged valves in a valve schedule.

15

16 VALVE-SCHEDULE INSTALLATION

- 17 Mount valve schedule on wall in accessible location in each major equipment room.

18

19 WARNING-TAG INSTALLATION

- 20 Write required message on, and attach warning tags to, equipment and other items where required.

21

22 ADJUSTING

- 23 Relocate mechanical identification materials and devices that have become visually blocked by other
- 24 work.

25

26 END OF SECTION

1 **SECTION 22 0700 - PLUMBING INSULATION**

2
3 **GENERAL**

4
5 **Summary**

6 This Section includes mechanical insulation for boiler breeching, duct, equipment, and pipe,
7 including the following:

8 Insulation Materials:

9 Calcium silicate.

10 Flexible elastomeric.

11 Mineral fiber.

12 Adhesives.

13 Mastics.

14 Lagging adhesives.

15 Sealants.

16 Factory-applied jackets.

17 Field-applied jackets.

18 Tapes.

19 Securements.

20 Corner angles.

21
22 **Definitions**

23 ASJ: All-service jacket.

24 FSK: Foil, scrim, kraft paper.

25 FSP: Foil, scrim, polyethylene.

26 PVDC: Polyvinylidene chloride.

27 SSL: Self-sealing lap.

28
29 **Submittals**

30 Product Data: For each type of product indicated, identify thermal conductivity, thickness, and
31 jackets (both factory and field applied, if any), and flame spread and smoke developed indices.
32 For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated
33 according to 40 CFR 59, Subpart D (EPA Method 24).

34
35 **Coordination**

36 Coordinate size and location of supports, hangers, and insulation shields specified in Division 22
37 Section "Hangers and Supports."

38 Coordinate clearance requirements with piping Installer for piping insulation application duct
39 Installer for duct insulation application, and equipment Installer for equipment insulation
40 application. Before preparing piping and ductwork Shop Drawings, establish and maintain
41 clearance requirements for installation of insulation and field-applied jackets and finishes and
42 for space required for maintenance.

43
44 **Scheduling**

45 Schedule insulation application after pressure testing systems and, where required, after
46 installing and testing heat tracing. Insulation application may begin on segments that have
47 satisfactory test results.

1 PRODUCTS

2
3 Manufacturers

4 In other Part 2 articles where titles below introduce lists, the following requirements apply to
5 product selection:

6 Products: Subject to compliance with requirements, provide one of the products specified.

7 Manufacturers: Subject to compliance with requirements, provide products by one of the
8 manufacturers specified.

9
10 Insulation Materials

11 Refer to Part 3 schedule articles for requirements about where insulating materials shall be
12 applied.

13 Products shall not contain asbestos, lead, mercury, or mercury compounds.

14 Products that come in contact with stainless steel shall have a leachable chloride content of less
15 than 50 ppm when tested according to ASTM C 871.

16 Calcium Silicate:

17 Products:

18 Industrial Insulation Group (The); Thermo-12 Gold.

19 Preformed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible,
20 inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with
21 ASTM C 533, Type I.

22 Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate
23 with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.

24 Prefabricated Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions used in
25 preforming insulation to cover valves, elbows, tees, and flanges.

26 Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with
27 ASTM C 534, Type I for tubular materials and Type II for sheet materials.

28 Products:

29 Aeroflex USA Inc.; Aerocel.

30 Armacell LLC; AP Armaflex.

31 RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

32 Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin.
33 Comply with ASTM C 553, Type II and ASTM C 1290. Factory-applied jacket requirements are
34 specified in Part 2 "Factory-Applied Jackets" Article.

35 Products:

36 CertainTeed Corp.; Duct Wrap.

37 Johns Manville; Microlite.

38 Knauf Insulation; Duct Wrap.

39 Manson Insulation Inc.; Alley Wrap.

40 Owens Corning; All-Service Duct Wrap.

41 Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin.
42 Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide
43 insulation with factory-applied FSK jacket. For equipment applications, provide insulation
44 without factory-applied jacket. Factory-applied jacket requirements are specified in Part 2
45 "Factory-Applied Jackets" Article.

46 Products:

47 CertainTeed Corp.; Commercial Board.

48 Fibrex Insulations Inc.; FBX.

1 Johns Manville; 800 Series Spin-Glas.
 2 Knauf Insulation; Insulation Board.
 3 Manson Insulation Inc.; AK Board.
 4 Owens Corning; Fiberglas 700 Series.
 5 High-Temperature, Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a
 6 thermosetting resin. Comply with ASTM C 612, Type III, without factory-applied jacket.
 7 Products:

8 Fibrex Insulations Inc.; FBX.
 9 Johns Manville; 1000 Series Spin-Glas.
 10 Owens Corning; High Temperature Industrial Board Insulations.
 11 Rock Wool Manufacturing Company; Delta Board.
 12 Roxul Inc.; Roxul RW.
 13 Thermafiber; Thermafiber Industrial Felt.

14 Mineral-Fiber, Preformed Pipe Insulation:
 15 Products:

16 Johns Manville; Micro-Lok.
 17 Knauf Insulation; 1000(Pipe Insulation.
 18 Manson Insulation Inc.; Alley-K.
 19 Owens Corning; Fiberglas Pipe Insulation.

20 Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply
 21 with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket
 22 requirements are specified in Part 2 "Factory-Applied Jackets" Article.

23 Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting
 24 resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or
 25 Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5
 26 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F
 27 or less. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets"
 28 Article.

29 Products:

30 CertainTeed Corp.; CrimpWrap.
 31 Johns Manville; MicroFlex.
 32 Knauf Insulation; Pipe and Tank Insulation.
 33 Manson Insulation Inc.; AK Flex.
 34 Owens Corning; Fiberglas Pipe and Tank Insulation.

35 Granular Direct Buried Pipe Insulation: Engineered inorganic non-toxic, non-flammable, sodium
 36 potassium aluminum silicate insulation with calcium carbonate filler. The insulation shall be
 37 chemically treated to render it hydrophobic. The insulation shall be have a thermal conductivity
 38 (K-value) of no more than 0.60 Btu/hr/sq. ft./Deg F/in. at a density of 40 lb/cu ft at a mean
 39 temperature of 175° F and 0.65 Btu/hr/sq. ft./Deg F/in. at a mean temperature of 300° F.
 40 Protective coating requirements are specified in Part 2 "Protective Coatings" article.

41 Products:

42 Gilsulate 500XR

43 Adhesives

44 Materials shall be compatible with insulation materials, jackets, and substrates and for bonding
 45 insulation to itself and to surfaces to be insulated, unless otherwise indicated.

46 Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature
 47 range of 50 to 800 deg F.

48 Products:

1 Childers Products, Division of ITW; CP-97.
 2 Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.
 3 Marathon Industries, Inc.; 290.
 4 Mon-Eco Industries, Inc.; 22-30.
 5 Vimasco Corporation; 760.

6 Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 7 Products:

8 Aeroflex USA Inc.; Aero Seal.
 9 Armacell LCC; 520 Adhesive.
 10 Foster Products Corporation, H. B. Fuller Company; 85-75.
 11 RBX Corporation; Rubatex Contact Adhesive.

12
 13 For indoor applications, use adhesive that has a VOC content of 80 g/L or less when
 14 calculated according to 40 CFR 59, Subpart D (EPA Method 24).

15 Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 16 Products:

17 Childers Products, Division of ITW; CP-82.
 18 Foster Products Corporation, H. B. Fuller Company; 85-20.
 19 ITW TACC, Division of Illinois Tool Works; S-90/80.
 20 Marathon Industries, Inc.; 225.
 21 Mon-Eco Industries, Inc.; 22-25.

22
 23 For indoor applications, use adhesive that has a VOC content of 80 g/L or less when
 24 calculated according to 40 CFR 59, Subpart D (EPA Method 24).

25 ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A
 26 for bonding insulation jacket lap seams and joints.

27 Products:
 28 Childers Products, Division of ITW; CP-82.
 29 Foster Products Corporation, H. B. Fuller Company; 85-20.
 30 ITW TACC, Division of Illinois Tool Works; S-90/80.
 31 Marathon Industries, Inc.; 225.
 32 Mon-Eco Industries, Inc.; 22-25.

33
 34 For indoor applications, use adhesive that has a VOC content of 80 g/L or less when
 35 calculated according to 40 CFR 59, Subpart D (EPA Method 24).

36 PVC Jacket Adhesive: Compatible with PVC jacket.

37 Products:
 38 Dow Chemical Company (The); 739, Dow Silicone.
 39 Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 40 P.I.C. Plastics, Inc.; Welding Adhesive.
 41 Red Devil, Inc.; Celulon Ultra Clear.
 42 Speedline Corporation; Speedline Vinyl Adhesive.

43
 44 For indoor applications, use adhesive that has a VOC content of 80 g/L or less when
 45 calculated according to 40 CFR 59, Subpart D (EPA Method 24).

46 Mastics

47 Materials shall be compatible with insulation materials, jackets, and substrates; comply with
 48 MIL-C-19565C, Type II.

1 Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient
2 services.

3 Products:

- 4 Childers Products, Division of ITW; CP-35.
- 5 Foster Products Corporation, H. B. Fuller Company; 30-90.
- 6 ITW TACC, Division of Illinois Tool Works; CB-50.
- 7 Marathon Industries, Inc.; 590.
- 8 Mon-Eco Industries, Inc.; 55-40.
- 9 Vimasco Corporation; 749.

10 Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.

11 Service Temperature Range: Minus 20 to plus 180 deg F.

12 Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.

13 Color: White.

14 Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

15 Products:

- 16 Childers Products, Division of ITW; CP-10.
- 17 Foster Products Corporation, H. B. Fuller Company; 35-00.
- 18 ITW TACC, Division of Illinois Tool Works; CB-05/15.
- 19 Marathon Industries, Inc.; 550.
- 20 Mon-Eco Industries, Inc.; 55-50.
- 21 Vimasco Corporation; WC-1/WC-5.

22 Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.

23 Service Temperature Range: Minus 20 to plus 200 deg F.

24 Solids Content: 63 percent by volume and 73 percent by weight.

25 Color: White.

26

27 Lagging Adhesives

28 Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation
29 materials, jackets, and substrates.

30 Products:

- 31 Childers Products, Division of ITW; CP-52.
- 32 Foster Products Corporation, H. B. Fuller Company; 81-42.
- 33 Marathon Industries, Inc.; 130.
- 34 Mon-Eco Industries, Inc.; 11-30.
- 35 Vimasco Corporation; 136.

36 Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant
37 lagging cloths over duct, equipment, and pipe insulation.

38 Service Temperature Range: Minus 50 to plus 180 deg F.

39 Color: White.

40

41 Sealants

42 FSK and Metal Jacket Flashing Sealants:

43 Products:

- 44 Childers Products, Division of ITW; CP-76-8.
- 45 Foster Products Corporation, H. B. Fuller Company; 95-44.
- 46 Marathon Industries, Inc.; 405.
- 47 Mon-Eco Industries, Inc.; 44-05.
- 48 Vimasco Corporation; 750.

1 Materials shall be compatible with insulation materials, jackets, and substrates.

2 Fire- and water-resistant, flexible, elastomeric sealant.

3 Service Temperature Range: Minus 40 to plus 250 deg F.

4 Color: Aluminum.

5 ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

6 Products:

7 Childers Products, Division of ITW; CP-76.

8 Materials shall be compatible with insulation materials, jackets, and substrates.

9 Fire- and water-resistant, flexible, elastomeric sealant.

10 Service Temperature Range: Minus 40 to plus 250 deg F.

11 Color: White.

12
13 For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated
14 according to 40 CFR 59, Subpart D (EPA Method 24).

15 16 Factory-Applied Jackets

17 Insulation system schedules indicate factory-applied jackets on various applications. When
18 factory-applied jackets are indicated, comply with the following:

19 ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with
20 ASTM C 1136, Type I.

21 ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a
22 removable protective strip; complying with ASTM C 1136, Type I.

23 FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with
24 ASTM C 1136, Type II.

25 FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying
26 with ASTM C 1136, Type II.

27 PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with
28 a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index
29 of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

30 31 Field-Applied Jackets

32 Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

33 FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

34 PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-
35 C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is
36 indicated in field-applied jacket schedules.

37 Products:

38 Johns Manville; Zeston.

39 P.I.C. Plastics, Inc.; FG Series.

40 Proto PVC Corporation; LoSmoke.

41 Speedline Corporation; SmokeSafe.

42 Adhesive: As recommended by jacket material manufacturer.

43 Color: White.

44 Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

45 Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions,
46 reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply
47 covers for lavatories.

48 Factory-fabricated tank heads and tank side panels.

- 1 Metal Jacket:
 2 Products:
 3 Childers Products, Division of ITW; Metal Jacketing Systems.
 4 PABCO Metals Corporation; Surefit.
 5 RPR Products, Inc.; Insul-Mate.
 6 Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 7 Factory cut and rolled to size.
 8 Finish and thickness are indicated in field-applied jacket schedules.
 9 Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and
 10 kraft paper.
 11 Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and
 12 kraft paper.
 13 Factory-Fabricated Fitting Covers:
 14 Same material, finish, and thickness as jacket.
 15 Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 16 Tee covers.
 17 Flange and union covers.
 18 End caps.
 19 Beveled collars.
 20 Valve covers.
 21 Field fabricate fitting covers only if factory-fabricated fitting covers are not
 22 available.
 23 PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with
 24 a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index
 25 of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
 26 Products:
 27 Dow Chemical Company (The), Saran 540 Vapor Retarder Film.
 28 PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive
 29 covered by a removable protective strip.
 30 Tapes
 31 ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive,
 32 complying with ASTM C 1136 and UL listed.
 33 Products:
 34 Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
 35 Compac Corp.; 104 and 105.
 36 Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
 37 Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 38 Width: 3 inches.
 39 Thickness: 11.5 mils.
 40 Adhesion: 90 ounces force/inch in width.
 41 Elongation: 2 percent.
 42 Tensile Strength: 40 lbf/inch in width.
 43 ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
 44 FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive;
 45 complying with ASTM C 1136 and UL listed.
 46 Products:
 47 Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 48 Compac Corp.; 110 and 111.

- 1 Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
 2 Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
 3 Width: 3 inches.
 4 Thickness: 6.5 mils.
 5 Adhesion: 90 ounces force/inch in width.
 6 Elongation: 2 percent.
 7 Tensile Strength: 40 lbf/inch in width.
 8 FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
 9 PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive.
 10 Suitable for indoor and outdoor applications.
 11 Products:
 12 Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
 13 Compac Corp.; 130.
 14 Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
 15 Venture Tape; 1506 CW NS.
 16 Width: 2 inches.
 17 Thickness: 6 mils.
 18 Adhesion: 64 ounces force/inch in width.
 19 Elongation: 500 percent.
 20 Tensile Strength: 18 lbf/inch in width.
 21 Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.
 22 Products:
 23 Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 24 Compac Corp.; 120.
 25 Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
 26 Venture Tape; 3520 CW.
 27 Width: 2 inches.
 28 Thickness: 3.7 mils.
 29 Adhesion: 100 ounces force/inch in width.
 30 Elongation: 5 percent.
 31 Tensile Strength: 34 lbf/inch in width.
 32 PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
 33 Products:
 34 Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.
 35 Width: 3 inches.
 36 Film Thickness: 4 mils.
 37 Adhesive Thickness: 1.5 mils.
 38 Elongation at Break: 145 percent.
 39 Tensile Strength: 55 lbf/inch in width.
 40
 41 **Securements**
 42 Bands:
 43 Products:
 44 Childers Products; Bands.
 45 PABCO Metals Corporation; Bands.
 46 RPR Products, Inc.; Bands.
 47 Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2
 48 inch wide with wing seal.

1 Insulation Pins and Hangers:
 2 Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-
 3 discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated.

4 Products:

5 AGM Industries, Inc.; CWP-1.
 6 GEMCO; CD.
 7 Midwest Fasteners, Inc.; CD.
 8 Nelson Stud Welding; TPA, TPC, and TPS.

9 Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed
 10 for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation
 11 indicated with integral 1-1/2-inch galvanized carbon-steel washer.

12 Products:

13 AGM Industries, Inc.; CWP-1.
 14 GEMCO; Cupped Head Weld Pin.
 15 Midwest Fasteners, Inc.; Cupped Head.
 16 Nelson Stud Welding; CHP.

17 Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

18

19 Corner Angles

20 PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784,
 21 Class 16354-C. White or color-coded to match adjacent surface.

22 Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to
 23 ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

24

25 Protective Coatings

26 Underground Direct Buried Pipe Coating: Bitumastic self-priming, heavy duty, cold applied,
 27 water proof coating made from pitch derived from tar and solvents.

28 Products:

29 Carboline "Bitumastic Super Service Black".

30

31 EXECUTION

32

33 Examination

34 Examine substrates and conditions for compliance with requirements for installation and other
 35 conditions affecting performance of insulation application.

36 Verify that systems and equipment to be insulated have been tested and are free of defects.

37 Verify that surfaces to be insulated are clean and dry.

38 Proceed with installation only after unsatisfactory conditions have been corrected.

39

40 Preparation

41 Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will
 42 adversely affect insulation application.

43 Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a
 44 corrosion coating to insulated surfaces as follows:

45 Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F
 46 with an epoxy coating. Consult coating manufacturer for appropriate coating materials and
 47 application methods for operating temperature range.

1 Coordinate insulation installation with the trade installing heat tracing. Comply with
2 requirements for heat tracing that apply to insulation.

3
4 Common Installation Requirements

5 Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces;
6 free of voids throughout the length of equipment, ducts and fittings, and piping including
7 fittings, valves, and specialties.

8 Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required
9 for each item of equipment, duct system, and pipe system as specified in insulation system
10 schedules.

11 Install accessories compatible with insulation materials and suitable for the service. Install
12 accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or
13 dry state.

14 Install insulation with longitudinal seams at top and bottom of horizontal runs.

15 Install multiple layers of insulation with longitudinal and end seams staggered.

16 Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

17 Keep insulation materials dry during application and finishing.

18 Install insulation with tight longitudinal seams and end joints. Bond seams and joints with
19 adhesive recommended by insulation material manufacturer.

20 Install insulation with least number of joints practical.

21 Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation with vapor-
22 barrier mastic.

23 Install insulation continuously through hangers and anchor attachments.

24 For insulation application where vapor barriers are indicated, extend insulation on anchor legs
25 from point of attachment to supported item to point of attachment to structure. Taper and seal
26 ends at attachment to structure with vapor-barrier mastic.

27 Install insert materials and install insulation to tightly join the insert. Seal insulation to
28 insulation inserts with adhesive or sealing compound recommended by insulation material
29 manufacturer.

30 Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket,
31 arranged to protect jacket from tear or puncture by hanger, support, and shield.

32 Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet
33 and dry film thicknesses.

34 Install insulation with factory-applied jackets as follows:

35 Draw jacket tight and smooth.

36 Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket.

37 Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4
38 inches o.c.

39 Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal
40 seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with
41 outward clinching staples along edge at 2 inches o.c.

42 For below ambient services, apply vapor-barrier mastic over staples.

43 Cover joints and seams with tape as recommended by insulation material manufacturer to
44 maintain vapor seal.

45 Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends
46 adjacent to duct and pipe flanges and fittings.

47 Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal
48 thickness.

- 1 Finish installation with systems at operating conditions. Repair joint separations and cracking
 2 due to thermal movement.
 3 Repair damaged insulation facings by applying same facing material over damaged areas.
 4 Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches
 5 similar to butt joints.
 6 For above ambient services, do not install insulation to the following:
 7 Vibration-control devices.
 8 Testing agency labels and stamps.
 9 Nameplates and data plates.
 10 Manholes.
 11 Handholes.
 12 Cleanouts.

14 Penetrations

- 15 Insulation Installation at Roof Penetrations: Install insulation continuously through roof
 16 penetrations.
 17 Seal penetrations with flashing sealant.
 18 For applications requiring only indoor insulation, terminate insulation above roof surface and
 19 seal with joint sealant. For applications requiring indoor and outdoor insulation, install
 20 insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint
 21 sealant.
 22 Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof
 23 flashing.
 24 Seal jacket to roof flashing with flashing sealant.
 25 Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush
 26 with sleeve seal. Seal terminations with flashing sealant.
 27 Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation
 28 continuously through wall penetrations.
 29 Seal penetrations with flashing sealant.
 30 For applications requiring only indoor insulation, terminate insulation inside wall surface and
 31 seal with joint sealant. For applications requiring indoor and outdoor insulation, install
 32 insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint
 33 sealant.
 34 Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2
 35 inches.
 36 Seal jacket to wall flashing with flashing sealant.
 37 Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated):
 38 Install insulation continuously through walls and partitions.
 39 Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation
 40 continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire
 41 damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper
 42 sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
 43 Firestopping and fire-resistive joint sealers are specified in Division 07 Section "Through-
 44 Penetration Firestop Systems."
 45 Insulation Installation at Floor Penetrations:
 46 Duct: Install insulation continuously through floor penetrations that are not fire rated. For
 47 penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and

1 externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap
2 damper sleeve and duct insulation at least 2 inches.
3 Pipe: Install insulation continuously through floor penetrations.
4 Seal penetrations through fire-rated assemblies according to Division 07 Section "Through-
5 Penetration Firestop Systems."
6

7 Duct And Plenum Insulation Installation

8 Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
9 Apply adhesives according to manufacturer's recommended coverage rates per unit area, for
10 100 percent coverage of duct and plenum surfaces.

11 Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
12 Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-
13 discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as
14 follows:

15 On duct sides with dimensions 18 inches and smaller, place pins along longitudinal
16 centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches
17 o.c.

18 On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way,
19 and 3 inches maximum from insulation joints. Install additional pins to hold insulation
20 tightly against surface at cross bracing.
21

22 Equipment, Tank, And Vessel Insulation Installation

23 Secure insulation with adhesive and anchor pins and speed washers.

24 Apply adhesives according to manufacturer's recommended coverage rates per unit area, for
25 100 percent coverage of tank and vessel surfaces.

26 Groove and score insulation materials to fit as closely as possible to equipment, including
27 contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.

28 Protect exposed corners with secured corner angles.

29 Install adhesively attached or self-sticking insulation hangers and speed washers on sides of
30 tanks and vessels as follows:

31 Do not weld anchor pins to ASME-labeled pressure vessels.

32 Select insulation hangers and adhesive that are compatible with service temperature
33 and with substrate.

34 On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end
35 joints, and 16 inches o.c. in both directions.

36 Do not overcompress insulation during installation.

37 Cut and miter insulation segments to fit curved sides and domed heads of tanks and
38 vessels.

39 Impale insulation over anchor pins and attach speed washers.

40 Cut excess portion of pins extending beyond speed washers or bend parallel with
41 insulation surface. Cover exposed pins and washers with tape matching insulation
42 facing.

43 Secure each layer of insulation with stainless-steel or aluminum bands. Select band material
44 compatible with insulation materials.

45 Where insulation hangers on equipment and vessels are not permitted or practical and where
46 insulation support rings are not provided, install a girdle network for securing insulation. Stretch
47 prestressed aircraft cable around the diameter of vessel and make taut with clamps,
48 turnbuckles, or breather springs. Place one circumferential girdle around equipment

1 approximately 6 inches from each end. Install wire or cable between two circumferential girdles
2 12 inches o.c. Install a wire ring around each end and around outer periphery of center
3 openings, and stretch prestressed aircraft cable radially from the wire ring to nearest
4 circumferential girde. Install additional circumferential girdles along the body of equipment or
5 tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie
6 wire or bands.

7 Stagger joints between insulation layers at least 3 inches

8 Install insulation in removable segments on equipment access doors, manholes, handholes, and
9 other elements that require frequent removal for service and inspection.

10 Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.

11 For equipment with surface temperatures below ambient, apply mastic to open ends, joints,
12 seams, breaks, and punctures in insulation.

13 Insulation Installation on Pumps:

14 Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints
15 with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch
16 centers, starting at corners. Install 3/8-inch-diameter fasteners with wing nuts. Alternatively,
17 secure the box sections together using a latching mechanism.

18 Fabricate boxes from galvanized steel, at least .040 inch thick.

19 For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal
20 between flanges with replaceable gasket material to form a vapor barrier.

21 22 General Pipe Insulation Installation

23 Requirements in this Article generally apply to all insulation materials except where more
24 specific requirements are specified in various pipe insulation material installation articles.

25 Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

26 Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with
27 continuous thermal and vapor-retarder integrity, unless otherwise indicated.

28 Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same
29 material and density as adjacent pipe insulation. Each piece shall be butted tightly against
30 adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with
31 insulating cement finished to a smooth, hard, and uniform contour that is uniform with
32 adjoining pipe insulation.

33 Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same
34 material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each
35 section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

36 Insulate valves using preformed fitting insulation or sectional pipe insulation of same material,
37 density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less
38 than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For
39 valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill
40 joints, seams, and irregular surfaces with insulating cement.

41 Insulate strainers using preformed fitting insulation or sectional pipe insulation of same
42 material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by
43 not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is
44 thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so
45 strainer basket flange or plug can be easily removed and replaced without damaging the
46 insulation and jacket. Provide a removable reusable insulation cover. For below ambient
47 services, provide a design that maintains vapor barrier.

1 Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap
2 adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe
3 diameter, whichever is thicker.
4 Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic.
5 Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient
6 services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and
7 well-shaped contour.
8 For services not specified to receive a field-applied jacket except for flexible elastomeric install
9 fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with
10 PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
11 Label the outside insulation jacket of each union with the word "UNION." Match size and color
12 of pipe labels.
13 Insulate instrument connections for thermometers, pressure gages, pressure temperature taps,
14 test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels,
15 and equipment. Shape insulation at these connections by tapering it to and around the
16 connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
17 Install removable insulation covers as necessary. Installation shall conform to the following:
18 Make removable flange and union insulation from sectional pipe insulation of same thickness as
19 that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
20 When flange and union covers are made from sectional pipe insulation, extend insulation from
21 flanges or union long at least two times the insulation thickness over adjacent pipe insulation on
22 each side of flange or union. Secure flange cover in place with stainless-steel or aluminum
23 bands. Select band material compatible with insulation and jacket.
24 Construct removable valve insulation covers in same manner as for flanges except divide the
25 two-part section on the vertical center line of valve body.
26 When covers are made from block insulation, make two halves, each consisting of mitered
27 blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to
28 flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each
29 side of valve. Fill space between flange or union cover and pipe insulation with insulating
30 cement. Finish cover assembly with insulating cement applied in two coats. After first coat is
31 dry, apply and trowel second coat to a smooth finish.
32 Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a
33 metal jacket.
34

35 Calcium Silicate Insulation Installation

36 Insulation Installation on Straight Pipes and Tubes:
37 Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands
38 without deforming insulation materials.
39 Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner
40 layer with wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-
41 inch intervals.
42 Apply a skim coat of mineral-fiber, hydraulic-setting cement to insulation surface. When
43 cement is dry, provide aluminum, Stucco embossed jacket, 0.01610 thick.
44 Insulation Installation on Pipe Flanges:
45 Install preformed pipe insulation to outer diameter of pipe flange.
46 Make width of insulation section same as overall width of flange and bolts, plus twice the
47 thickness of pipe insulation.

1 Fill voids between inner circumference of flange insulation and outer circumference of adjacent
2 straight pipe segments with cut sections of block insulation of same material and thickness as
3 pipe insulation.

4 Finish flange insulation same as pipe insulation.

5 Insulation Installation on Pipe Fittings and Elbows:

6 Install preformed sections of same material as straight segments of pipe insulation when
7 available. Secure according to manufacturer's written instructions.

8 When preformed insulation sections of insulation are not available, install mitered sections of
9 calcium silicate insulation. Secure insulation materials with wire or bands.

10 Finish fittings insulation same as pipe insulation.

11 Insulation Installation on Valves and Pipe Specialties:

12 Install mitered segments of calcium silicate insulation to valve body. Arrange insulation to
13 permit access to packing and to allow valve operation without disturbing insulation.

14 Install insulation to flanges as specified for flange insulation application.

15 Finish valve and specialty insulation same as pipe insulation.

16

17 Flexible Elastomeric Insulation Installation

18 Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate
19 openings in insulation that allow passage of air to surface being insulated.

20 Insulation Installation on Pipe Fittings and Elbows:

21 Install mitered sections of pipe insulation.

22 Secure insulation materials and seal seams with manufacturer's recommended adhesive to
23 eliminate openings in insulation that allow passage of air to surface being insulated.

24 Insulation Installation on Valves and Pipe Specialties:

25 Install preformed valve covers manufactured of same material as pipe insulation when available.

26 When preformed valve covers are not available, install cut sections of pipe and sheet insulation
27 to valve body. Arrange insulation to permit access to packing and to allow valve operation
28 without disturbing insulation.

29 Install insulation to flanges as specified for flange insulation application.

30 Secure insulation to valves and specialties and seal seams with manufacturer's recommended
31 adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

32

33 Mineral-Fiber Insulation Installation

34 Insulation Installation on Straight Pipes and Tubes:

35 Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands
36 without deforming insulation materials.

37 Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with
38 vapor-barrier mastic and joint sealant.

39 For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward
40 clinched staples at 6 inches o.c.

41 For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal
42 tabs but secure tabs with additional adhesive as recommended by insulation material
43 manufacturer and seal with vapor-barrier mastic and flashing sealant.

44 Insulation Installation on Pipe Flanges:

45 Install preformed pipe insulation to outer diameter of pipe flange.

46 Make width of insulation section same as overall width of flange and bolts, plus twice the
47 thickness of pipe insulation.

- 1 Fill voids between inner circumference of flange insulation and outer circumference of adjacent
2 straight pipe segments with mineral-fiber blanket insulation.
- 3 Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1
4 inch, and seal joints with flashing sealant.
- 5 Insulation Installation on Pipe Fittings and Elbows:
- 6 Install preformed sections of same material as straight segments of pipe insulation when
7 available.
- 8 When preformed insulation elbows and fittings are not available, install mitered sections of pipe
9 insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with
10 wire or bands.
- 11 Insulation Installation on Valves and Pipe Specialties:
- 12 Install preformed sections of same material as straight segments of pipe insulation when
13 available.
- 14 When preformed sections are not available, install mitered sections of pipe insulation to valve
15 body.
- 16 Arrange insulation to permit access to packing and to allow valve operation without disturbing
17 insulation.
- 18 Install insulation to flanges as specified for flange insulation application.
- 19 Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
20 Apply adhesives according to manufacturer's recommended coverage rates per unit area, for
21 100 percent coverage of duct and plenum surfaces.
- 22 Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
23 Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-
24 discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as
25 follows:
- 26 On duct sides with dimensions 18 inches and smaller, place pins along longitudinal
27 centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches
28 o.c.
- 29 On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way
30 and 3 inches maximum from insulation joints. Install additional pins to hold insulation
31 tightly against surface at cross bracing.
- 32 Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
33 Do not overcompress insulation during installation.
- 34 Impale insulation over pins and attach speed washers.
35 Cut excess portion of pins extending beyond speed washers or bend parallel with
36 insulation surface. Cover exposed pins and washers with tape matching insulation
37 facing.
- 38 For ducts and plenums with surface temperatures below ambient, install a continuous unbroken
39 vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by
40 removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to
41 adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c.
42 Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic,
43 and sealant at joints, seams, and protrusions.
- 44 Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier
45 seal.
- 46 Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end
47 joints, secure with steel bands spaced a maximum of 18 inches o.c.

- 1 Install insulation on rectangular duct elbows and transitions with a full insulation section for
 2 each surface. Install insulation on round and flat-oval duct elbows with individually mitered
 3 gores cut to fit the elbow.
- 4 Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-
 5 inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener,
 6 hanger, and flange with pins spaced 6 inches o.c.
- 7 Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 8 Apply adhesives according to manufacturer's recommended coverage rates per unit area, for
 9 100 percent coverage of duct and plenum surfaces.
- 10 Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 11 Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-
 12 discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as
 13 follows:
- 14 On duct sides with dimensions 18 inches and smaller, place pins along longitudinal
 15 centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches
 16 o.c.
- 17 On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way,
 18 and 3 inches maximum from insulation joints. Install additional pins to hold insulation
 19 tightly against surface at cross bracing.
- 20 Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 21 Do not overcompress insulation during installation.
- 22 Cut excess portion of pins extending beyond speed washers or bend parallel with
 23 insulation surface. Cover exposed pins and washers with tape matching insulation
 24 facing.
- 25 For ducts and plenums with surface temperatures below ambient, install a continuous unbroken
 26 vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by
 27 removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to
 28 adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c.
 29 Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic,
 30 and sealant at joints, seams, and protrusions.
- 31 Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier
 32 seal.
- 33 Install insulation on rectangular duct elbows and transitions with a full insulation section for
 34 each surface. Groove and score insulation to fit as closely as possible to outside and inside
 35 radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered
 36 gores cut to fit the elbow.
- 37 Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-
 38 inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener,
 39 hanger, and flange with pins spaced 6 inches o.c.

41 Field-Applied Jacket Installation

- 42 Where FSK jackets are indicated, install as follows:
- 43 Draw jacket material smooth and tight.
- 44 Install lap or joint strips with same material as jacket.
- 45 Secure jacket to insulation with manufacturer's recommended adhesive.
- 46 Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
- 47 Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with
 48 vapor-barrier mastic.

1 Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end
 2 joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks
 3 and vessels. Seal with manufacturer's recommended adhesive.

4 Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish
 5 bead along seam and joint edge.

6 Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end
 7 joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof
 8 sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12
 9 inches o.c. and at end joints.

10 Where PVDC jackets are indicated, install as follows:

11 Apply three separate wraps of filament tape per insulation section to secure pipe insulation to
 12 pipe prior to installation of PVDC jacket.

13 Wrap factory-presize jackets around individual pipe insulation sections with one end
 14 overlapping the previously installed sheet. Install presize jacket with an approximate overlap
 15 at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and
 16 then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.

17 Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or
 18 PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's
 19 written instructions for application of adhesives along this spiral edge to maintain a permanent
 20 bond.

21 Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an
 22 outer circumference of 33-1/2 inches or less. The 33-1/2-inch-circumference limit allows for 2-
 23 inch-overlap seal. Using the length of roll allows for longer sections of jacket to be installed at
 24 one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use
 25 PVDC tape along lap seal to secure joint.

26 Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a
 27 minimum of 1-1/4 circumferences to avoid damage to tape edges.

28 29 Direct Buried Pipe Insulation Installation

30 Trench, anchor, structural supports and pouring of insulation to be per manufacturer's
 31 installation instructions.

32 33 Finishes

34 Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material:
 35 Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

36 Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and
 37 finish coat paint. Add fungicidal agent to render fabric mildew proof.

38 Finish Coat Material: Interior, flat, latex-emulsion size.

39 Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of
 40 insulation manufacturer's recommended protective coating.

41 Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection
 42 of the completed Work.

43 Do not field paint aluminum or stainless-steel jackets.

44 45 Duct Insulation Schedule, General

46 Items Not Insulated:

47 Factory-insulated flexible ducts.

48 Factory-insulated plenums and casings.

- 1 Flexible connectors.
- 2 Vibration-control devices.
- 3 Factory-insulated access panels and doors.

5 Indoor Duct And Plenum Insulation Schedule

- 6 Concealed supply, return or outside air duct insulation shall be the following:
- 7 Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. Ft. nominal density exterior wrap.

9 Aboveground, Outdoor Duct And Plenum Insulation Schedule

- 10 Rectangular, supply or return air duct insulation shall be the following:
- 11 Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

13 Equipment Insulation Schedule

- 14 Insulation materials and thicknesses are identified below. If more than one material is listed for
- 15 a type of equipment, selection from materials listed is Contractor's option.
- 16 Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.
- 17 Heat-exchanger (water-to-water for cooling service) insulation shall be the following:
- 18 Mineral-Fiber Board: 1 inch thick and 2-lb/cu. ft. nominal density.
- 19 Chilled-water pump insulation shall be the following:
- 20 Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.
- 21 Heating-hot-water pump insulation shall be the following:
- 22 Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.
- 23 Chilled-water expansion/compression tank insulation shall be the following:
- 24 Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.
- 25 Heating-hot-water expansion/compression tank insulation shall be the following:
- 26 Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.

28 Piping Insulation Schedule, General

- 29 Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for
- 30 each piping system and pipe size range. If more than one material is listed for a piping system,
- 31 selection from materials listed is Contractor's option.
- 32 Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
- 33 Fire-suppression piping.
- 34 Below-grade piping.

36 Indoor Piping Insulation Schedule

- 37 Domestic Cold Water, condensate drain:
- 38 NPS 1 and Smaller: Insulation shall be the following:
- 39 Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
- 40 NPS 1-1/4 and Larger: Insulation shall be the following:
- 41 Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
- 42 Domestic Hot and Recirculated Hot Water:
- 43 NPS 1-1/4 and Smaller: Insulation shall be the following:
- 44 Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
- 45 NPS 1-1/2 and Larger: Insulation shall be the following:
- 46 Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
- 47 Stormwater and Overflow:
- 48 All Pipe Sizes: Insulation shall be the following: (Horizontal Pipe)

- 1 Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
 2 Roof Drain and Overflow Drain Bodies: (Roof Drain and Horizontal Pipe)
 3 All Pipe Sizes: Insulation shall be the following:
 4 Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
 5 Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures
 6 for People with Disabilities:
 7 All Pipe Sizes: Insulation shall be the following:
 8 Pre-manufactured pipe protection devices. Refer to plumbing schedules.
 9 Condensate and Equipment Drain Water below 60 Deg F:
 10 All Pipe Sizes: Insulation shall be the following:
 11 Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
 12 Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and
 13 Equipment Drain Water below 60 Deg F:
 14 All Pipe Sizes: Insulation shall be the following:
 15 Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.

17 Outdoor, Aboveground Piping Insulation Schedule

- 18 Refrigerant Suction and Hot-Gas Piping:
 19 All Pipe Sizes: Insulation shall be the following:
 20 Flexible Elastomeric: 2 inches thick, with UV resistant coating.

22 Indoor, Field-Applied Jacket Schedule

- 23 Install jacket over insulation material. For insulation with factory-applied jacket, install the field-
 24 applied jacket over the factory-applied jacket.
 25 If more than one material is listed, selection from materials listed is Contractor's option.
 26 Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:
 27 PVC: 20 mils thick.
 28 Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72
 29 Inches:
 30 Aluminum, Stucco Embossed with 1-1/4-Inch-Deep Corrugations: 0.032 inch 0.040 inch thick.
 31 Piping, Concealed:
 32 All Service Jacket with self-sealing lap. PVC fitting covers.
 33 Piping, Exposed:
 34 PVC: 20 mils thick up to 9 feet above finished floor. FSK above 9 feet.

36 Outdoor, Field-Applied Jacket Schedule

- 37 Install jacket over insulation material. For insulation with factory-applied jacket, install the field-
 38 applied jacket over the factory-applied jacket.
 39 If more than one material is listed, selection from materials listed is Contractor's option.
 40 Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:
 41 Aluminum, Stucco Embossed: 0.016 inch thick.
 42 Ducts and Plenums, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger
 43 Than 72 Inches:
 44 Aluminum, Stucco Embossed with 1-1/4-Inch Deep Corrugations 0.032 inch thick.
 45 Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:
 46 Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.016 inch thick.
 47 Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72
 48 Inches:

1910

- 1 Aluminum, Stucco Embossed with 1-1/4-Inch-Deep Corrugations: 0.032 inch thick.
- 2 Piping, Exposed:
- 3 Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.016 inch thick.
- 4
- 5 END OF SECTION

1 SECTION 22 0800 - PLUMBING SYSTEMS COMMISSIONING REQUIREMENTS

2
3 GENERAL

4
5 Description

6 The purpose of this section is to specify responsibilities of this Division for participating in the
7 commissioning process as directed by the CxA.

8
9 The equipment and systems to be commissioned are listed in Division 1, Section 01 9100.

10
11 Commissioning requires the participation of this Division to ensure that all systems are
12 operating in a manner consistent with the Contract Documents. The general commissioning
13 requirements and coordination are detailed in Section 01 9100. This Division shall be familiar
14 with all parts of Division 1 as well as the Commissioning Plan issued by the CxA, and shall
15 execute all commissioning responsibilities assigned to them in the Contract Documents.

16
17 The following are common abbreviations used in these specifications and the *Commissioning*
18 *Plan*.

19	A/E	Architect and Design Engineers	Functional Performance Test
20	CC	Controls Contractor	General Contractor (Prime)
21	CM	APS Construction Manager	Mechanical Contractor
22	Cx	Commissioning	Owner's Representative*
23	CxA	Commissioning Authority	Prefunctional Checklist
24	Cx Plan	Commissioning Plan Document	Subcontractors General
25	EC	Electrical Contractor	Test and Balance Contractor
26		*Normally APS Staff Architect or Construction Manager	

27
28 Definitions

29 Refer to Section 01 9100.

30
31 Responsibilities

32
33 Plumbing Contractors. The commissioning responsibilities applicable to the Plumbing
34 Contractor are as follows (*all references apply to commissioned equipment only*):

35
36 Include the cost of commissioning participation in the contract price.

37 In each purchase order or subcontract written, include Cx requirements for submittal data, Cx
38 documentation, O&M data and training.

39
40 Attend a commissioning scoping meeting (Cx 'Kickoff') and other necessary meetings scheduled
41 by the CxA to facilitate the Cx process.

42
43 Provide normal cut sheets and shop drawing submittals of commissioned equipment to the CxA.
44 Provide additional requested documentation to the CxA for development of startup and
45 functional testing procedures.

46
47 Typically this will include detailed manufacturer installation/startup instructions, operating,
48 troubleshooting and maintenance procedures, full details of any owner-contracted tests, full

1 factory testing reports (if any) and full warranty information, including all responsibilities of the
2 Owner to keep the warranty in force. In addition, the installation and checkout materials that
3 are shipped with the equipment, as well as the actual field checkout sheet forms to be used by
4 the factory or field technicians, shall be submitted to the CxA.

5
6 The CxA may request further documentation necessary for the commissioning process.

7
8 This data request may be made prior to normal submittals.

9
10 Provide a copy of the O&M manual submittals for commissioned equipment, through normal
11 channels, to the CxA for review and approval.

12
13 Assist the CxA in developing a full startup and initial checkout plan using manufacturer's
14 detailed startup procedures and/or the prefunctional checklists (PFCs) provided by the CxA.
15 Both the Contractor and CxA must agree on this plan prior to equipment startup.

16
17 Provide assistance to the CxA in preparing the specific functional performance test procedures.
18 Sub(s) shall review test procedures to ensure feasibility, safety and equipment protection, and
19 provide necessary written alarm limits to be used during the tests.

20
21 Assist (along with the design engineers) in clarifying the operation and control of commissioned
22 equipment in areas where the equipment documentation, specifications and/or control
23 drawings are not sufficient for writing detailed testing procedures.

24
25 Provide skilled technicians to execute starting of equipment and to execute the functional
26 performance tests. Ensure that they are available and present during the agreed upon
27 schedules and for sufficient duration to complete the necessary tests, adjustments and
28 problem-solving.

29
30 During the startup and initial checkout process, execute and document the plumbing-related
31 portions of the PFCs provided by the CxA for all commissioned equipment.
32 Perform and clearly document all completed startup and system operational checkout
33 procedures, providing a copy to the CxA.

34
35 Address current A/E punch list items before functional testing.

36
37 Perform functional performance testing under the direction of the CxA for specified equipment.
38 Assist the CxA in interpreting the monitoring data, as necessary.

39
40 Correct deficiencies (differences between specified and observed performance) as interpreted
41 by the CxA, CM and A/E and retest the equipment.

42
43 Prepare O&M manuals according to the Contract Documents, including clarifying and updating
44 the original sequences of operation to as-built conditions.

45
46 Prepare red-line as-builts for all relevant drawings, and final as-builts for contractor-generated
47 coordination drawings.

48

1 Provide training of the Owner's operating personnel as specified.
 2 Coordinate with equipment manufacturers to determine specific requirements to maintain the
 3 validity of the warranty.
 4 Support seasonal or deferred functional performance testing by the CxA as required.

5
 6 Plumbing Contractor. The responsibilities of the plumbing contractor, during construction and
 7 acceptance phases in addition to those listed in (A) are:
 8 Provide startup for all plumbing equipment.

9
 10 Assist and cooperate with the and CxA by:
 11 Putting all Plumbing equipment and systems into operation and continuing the operation during
 12 each working day of commissioning, as required.

13
 14 Providing temperature and pressure taps according to the Construction Documents for
 15 commissioning testing.

16
 17 Install a P/T plug at each water sensor which is an input point to the control system.
 18 Notify the GC or CxA (depending on protocol) when pipe system testing, flushing, cleaning, and
 19 startup will occur. Be responsible to notify the GC and CxA in advance if it is suspected that
 20 commissioning activities not yet performed or not yet scheduled may delay construction. Be
 21 proactive in seeing that commissioning processes are executed and that the CxA has the
 22 scheduling information needed to efficiently execute the commissioning process.

23 24 25 EXECUTION

26 27 Submittals

28 Division shall provide submittal documentation relative to commissioned systems as requested
 29 by the CxA.

30 31 Startup

32 The Plumbing Contractor shall follow the startup and initial checkout procedures listed in 1.3
 33 'Responsibilities' of this section, as well as in Section 01 9100. Contractor has startup
 34 responsibility and is required to complete systems and sub-systems so they are fully functional,
 35 meeting the design objectives of the Contract Documents. The acts of participating in the
 36 commissioning process and performing functional testing do not relieve, lessen or shift
 37 Contractor's responsibility for providing such a result.

38
 39 Functional testing is intended to begin upon completion of a system's installation. Functional
 40 testing may proceed prior to the completion of a system or sub-system at the discretion of the
 41 CxA and CM. Beginning system testing before completion does not relieve the Contractor from
 42 fully completing the system, nor from completion of PFCs for that system.

43 44 Functional Performance Tests

45 Refer to Section 01 9100 for a list of systems to be commissioned and for details of the
 46 Functional Performance Testing process.

47 48 Documentation, Non-Conformance And Approvals

1 Refer to Section 01 9100 for specific details on non-conformance issues relating to
2 Prefunctional Checklists.

3
4 Refer to Section 01 9100 for details on deficiencies and non-conformance issues relating to
5 Functional Performance Tests.

6
7 Operation And Maintenance (O&M) Manuals

8 Compile and prepare documentation for all equipment and systems covered in this Division and
9 deliver to the GC for inclusion in the O&M manuals, according to Division 1.

10
11 Approval of the commissioning related sections of the O&M manuals shall be made by the A/E
12 and by the CxA. Refer to Division 1.

13
14 Training Of Owner Personnel

15 The GC shall be responsible for training coordination and scheduling and ultimately for ensuring
16 that training is completed. Refer to Section Division 1 for additional details.

17
18 The CxA shall be responsible for overseeing and approving the content and adequacy of the
19 training of Owner personnel for commissioned equipment. Refer to Division 1 for additional
20 details.

21
22 Plumbing Contractor. The plumbing contractor shall have the following training responsibilities:
23 Provide the CxA with a training plan two weeks before the planned training according to the
24 outline described in Division 1.

25
26 Provide designated Owner personnel with comprehensive training in the understanding of their
27 systems and the operation and maintenance of each commissioned plumbing system or major
28 piece of plumbing equipment.

29
30 Training shall normally start with classroom sessions followed by hands-on training on each
31 piece of equipment, illustrating the various modes of operation including startup, shutdown,
32 fire/smoke alarms, power failure, resets, etc.

33
34 During any demonstration, should the system fail to perform in accordance with the
35 requirements of the O&M manual or sequence of operations, the system will be repaired or
36 adjusted as necessary and the demonstration repeated.

37
38 Trainer(s) for plumbing systems shall possess practical building operating expertise as well as in-
39 depth knowledge of all modes of operation for their specific piece(s) of equipment. Trainers
40 may include the startup technician, installing contractor and/or manufacturer's representative.
41 More than one party may be required to execute the training.

42
43 Training sessions shall follow the outline in the Table of Contents of the Operation and
44 Maintenance manual, and illustrate whenever possible the use of the O&M manual as a
45 practical reference.

46
47 The format and training agenda described in *The HVAC Commissioning Process, ASHRAE*
48 *Guideline 0* is recommended.

1
2 Training shall include:
3 Use of the printed installation, operation and maintenance instruction material included in the
4 O&M manuals.
5
6 A review of the written O&M instructions emphasizing safe and proper operating requirements,
7 preventative maintenance, special tools needed and spare parts inventory suggestions.
8 Discussion of relevant health and safety issues and concerns.
9 Discussion of warranties and guarantees.
10 Common troubleshooting problems and solutions.
11 Explanatory information included in the O&M manuals and the location of all plans and manuals
12 in the facility.
13 Discussion of any peculiarities of equipment installation or operation.
14 Classroom sessions shall include the use of visual aids as appropriate.
15 Hands-on training shall include startup, operation in all modes possible, including manual, shut-
16 down and any emergency procedures, plus preventative maintenance for all pieces of
17 equipment.
18 Training shall occur after functional testing is complete, unless approved otherwise by the
19 Project Manager.

20
21 Deferred Testing

22 Refer to Section 01 9100 for requirements of deferred testing.
23

24 Written Work Products

25 Written work products of Contractors will consist of the startup and initial checkout plans
26 described in Section 01 9100 and the filled out startup and Prefunctional Checklists (PFCs), plus
27 O&M documentation as required.
28

29 END OF SECTION 22 0800

30
31 END OF SECTION

1 SECTION 22 1116 - DOMESTIC WATER PIPING

2
3 GENERAL

4
5 Summary

6 This Section includes domestic water piping and water meters inside the building.

7 Water meters will be furnished and installed by contractor.

8
9 Performance Requirements

10 Provide components and installation capable of producing domestic water piping systems with
11 80 psig, unless otherwise indicated.

12
13 Submittals

14 Product Data: For pipe, tube, fittings, and couplings and water meters.

15 Water Samples: Specified in Part 3 "Cleaning" Article.

16 Field quality-control test reports.

17
18 Quality Assurance

19 Piping materials shall bear label, stamp, or other markings of specified testing agency.

20 Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through
21 9," for potable domestic water piping and components.

22
23 PRODUCTS

24
25 Manufacturers

26 In other Part 2 articles where titles below introduce lists, the following requirements apply to
27 product selection:

28 Manufacturers: Subject to compliance with requirements, provide products by one of
29 the manufacturers specified.

30 Piping Materials

31 Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and
32 joining materials.

33 Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting
34 the same size as, with pressure rating at least equal to and ends compatible with, piping to be
35 joined.

36
37 Copper Tube And Fittings

38 Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

39 Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-
40 copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

41 Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300
42 flanges if required to match piping.

43 Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-
44 socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

45 Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.

46 Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-
47 copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

48 Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300
49 flanges if required to match piping.

Water Meters

Compound-Type Water Meters NPS 2 and Larger: AWWA C702, totalization meter with integral main-line and bypass meters, bronze case, and 150-psig minimum working-pressure rating; with registration in gallons or cubic feet as required by CSU; and with flanged end connections.

Manufacturers:

Badger Meter, Inc.

Neptune

Remote Registration System: Direct-reading type complying with AWWA C706; modified with signal transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by CSU.

EXECUTIONExcavation

Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

Pipe And Fitting Applications

Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

Flanges may be used on aboveground piping, unless otherwise indicated.

Under-Building-Slab, Water-Service Piping on Service Side of Water Meter: Refer to Division 2 Section "Water Distribution."

Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, NPS 4 and Smaller: Soft copper tube, Type L; copper pressure fittings; and soldered joints.

Aboveground Domestic Water Piping: Use the following piping materials for each size range:
NPS 1 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

NPS 1-1/4 and NPS 1-1/2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

NPS 2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

NPS 2-1/2 to NPS 3-1/2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

Valve Applications

Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

Shutoff Duty: Use bronze ball for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.

Throttling Duty: Use globe valves for piping NPS 2 and smaller.

Hot-Water-Piping, Balancing Duty: Memory-stop balancing valves.

Drain Duty: Hose-end drain valves.

Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

Install hose-end drain valves at low points in water mains, risers, and branches.

- 1 Install stop-and-waste drain valves where indicated.
 2 Install balancing valve in each hot-water circulation return branch and discharge side of each
 3 pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball
 4 valves for piping NPS 2 and smaller. Balancing valves are specified in Division 15 Section
 5 "Plumbing Specialties."
 6 Install calibrated balancing valves in each hot-water circulation return branch and discharge side
 7 of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop
 8 flow. Calibrated balancing valves are specified in Division 15 Section "Plumbing Specialties."
 9

10 Piping Installation

- 11 Basic piping installation requirements are specified in Division 22 Section 220510 "Basic
 12 Mechanical Materials and Methods."
 13 Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."
 14 Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe
 15 penetration through foundation wall. Select number of interlocking rubber links required to
 16 make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22
 17 Section 220510 "Basic Mechanical Materials and Methods."
 18 Install wall penetration system at each service pipe penetration through foundation wall. Make
 19 installation watertight. Wall penetration systems are specified in Division 15 Section "Basic
 20 Mechanical Materials and Methods."
 21 Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside
 22 the building at each domestic water service entrance. Pressure gages are specified in
 23 Division 22 Section 220519 "Meters and Gages," and drain valves and strainers are specified in
 24 Division 22 Section 221119 "Plumbing Specialties."
 25 Install water-pressure regulators downstream from shutoff valves. Water-pressure regulators
 26 are specified in Division 22 Section 221119 "Plumbing Specialties."
 27 Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.
 28 Rough-in domestic water piping for water-meter installation according to utility company's
 29 requirements.
 30

31 Joint Construction

- 32 Basic piping joint construction requirements are specified in Division 22 Section 220510 "Basic
 33 Mechanical Materials and Methods."
 34 Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy
 35 solder; and ASTM B 828 procedure, unless otherwise indicated.
 36

37 Water Meter Installation

- 38 Water meters will be furnished and installed by contractor.
 39 Install water meters according to AWWA M6 and utility's requirements.
 40 Install compound-type water meters with shutoff valves on water-meter inlet and outlet
 41 and on valved bypass around meter. Support meters, valves, and piping on brick or
 42 concrete piers.
 43 Install remote registration system according to standards of CSU.

44 Hanger And Support Installation

- 45 Pipe hanger and support devices are specified in Division 22 Section 220529 "Hangers and
 46 Supports." Install the following:
 47 Vertical Piping: MSS Type 8 or Type 42, clamps.
 48 Individual, Straight, Horizontal Piping Runs: According to the following:

- 1 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 2 Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 3 Longer Than 100 Feet: MSS Type 49, spring cushion rolls, if indicated.
 4 Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls.
 5 Support pipe rolls on trapeze.
 6 Base of Vertical Piping: MSS Type 52, spring hangers.
 7 Install supports according to Division 22 Section 220529 "Hangers and Supports."
 8 Support vertical piping and tubing at base and at each floor.
 9 Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
 10 Install supports for vertical steel piping every 15 feet.
 11 Install hangers for copper tubing with the following maximum horizontal spacing and minimum
 12 rod diameters:
 13 NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 14 NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 15 NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 16 NPS 2-1/2: 108 inches with 1/2-inch rod.
 17 Install supports for vertical copper tubing every 10 feet.

- 18
 19 Connections
 20 Drawings indicate general arrangement of piping, fittings, and specialties.
 21 Install piping adjacent to equipment and machines to allow service and maintenance.
 22 Connect domestic water piping to exterior water-service piping. Use transition fitting to join
 23 dissimilar piping materials.
 24 Connect domestic water piping to water-service piping with shutoff valve, and extend and
 25 connect to the following:
 26 Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but
 27 not smaller than sizes of water heater connections.
 28 Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller
 29 than required by plumbing code. Refer to Division 22 Section 224000 "Plumbing
 30 Fixtures."
 31 Equipment: Cold- and hot-water supply piping as indicated, but not smaller than
 32 equipment connections. Provide shutoff valve and union for each connection. Use
 33 flanges instead of unions for NPS 2-1/2 and larger.

- 34
 35 Field Quality Control
 36 Inspect domestic water piping as follows:
 37 Do not enclose, cover, or put piping into operation until it has been inspected and
 38 approved by authorities having jurisdiction.
 39 During installation, notify authorities having jurisdiction at least 24 hours before
 40 inspection must be made. Perform tests specified below in presence of authorities
 41 having jurisdiction:
 42 Roughing-in Inspection: Arrange for inspection of piping before concealing or
 43 closing-in after roughing-in and before setting fixtures.
 44 Final Inspection: Arrange final inspection for authorities having jurisdiction to
 45 observe tests specified below and to ensure compliance with requirements.
 46 Reinspection: If authorities having jurisdiction find that piping will not pass test or
 47 inspection, make required corrections and arrange for reinspection.

1 Reports: Prepare inspection reports and have them signed by authorities having
2 jurisdiction.

3 Test domestic water piping as follows:

4 Fill domestic water piping. Check components to determine that they are not air bound
5 and that piping is full of water.

6 Test for leaks and defects in new piping and parts of existing piping that have been
7 altered, extended, or repaired. If testing is performed in segments, submit separate
8 report for each test, complete with diagram of portion of piping tested.

9 Leave new, altered, extended, or replaced domestic water piping uncovered and
10 unconcealed until it has been tested and approved. Expose work that was covered or
11 concealed before it was tested.

12 Cap and subject piping to static water pressure of 50 psig above operating pressure,
13 without exceeding pressure rating of piping system materials. Isolate test source and
14 allow to stand for four hours. Leaks and loss in test pressure constitute defects that
15 must be repaired.

16 Repair leaks and defects with new materials and retest piping or portion thereof until
17 satisfactory results are obtained.

18 Prepare reports for tests and required corrective action.

19 20 Adjusting

21 Perform the following adjustments before operation:

22 Close drain valves, hydrants, and hose bibbs.

23 Open shutoff valves to fully open position.

24 Open throttling valves to proper setting.

25 Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

26 Manually adjust ball-type balancing valves in hot-water-circulation return piping
27 to provide flow of hot water in each branch.

28 Adjust calibrated balancing valves to flows indicated.

29 Remove plugs used during testing of piping and plugs used for temporary sealing of
30 piping during installation.

31 Remove and clean strainer screens. Close drain valves and replace drain plugs.

32 Remove filter cartridges from housings and verify that cartridges are as specified for
33 application where used and are clean and ready for use.

34 Check plumbing specialties and verify proper settings, adjustments, and operation.

35 Cleaning

36 Clean and disinfect potable domestic water piping as follows:

37 Purge new piping before using.

38 Use purging and disinfecting procedures prescribed by authorities having jurisdiction or,
39 if methods are not prescribed, procedures described in either AWWA C651 or

40 AWWA C652 or as described below:

41 Flush piping system with clean, potable water until dirty water does not appear
42 at outlets.

43 Fill and isolate system according to either of the following:

44 Fill system or part thereof with water/chlorine solution with at least
45 50 ppm of chlorine. Isolate with valves and allow to stand for 24
46 hours.

47 Flush system with clean, potable water until no chlorine is in water coming from
48 system after the standing time.

- 1 Submit water samples in sterile bottles to authorities having jurisdiction.
- 2 Repeat procedures if biological examination shows contamination.
- 3 Prepare and submit reports of purging and disinfecting activities.
- 4 Clean interior of domestic water piping system. Remove dirt and debris as work progresses.
- 5
- 6 END OF SECTION

SECTION 22 1119 - DOMESTIC WATER PIPING SPECIALTIES**GENERAL****Summary**

This Section includes the following domestic water piping specialties:

Vacuum breakers.

Backflow preventers.

Water pressure-reducing valves.

Balancing valves.

Strainers.

Outlet boxes.

Hose stations.

Hose bibbs.

Wall hydrants.

Drain valves.

Water hammer arresters.

Air vents.

Trap-seal primer valves.

Trap-seal primer systems.

Performance Requirements

Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

Submittals

Product Data: For each type of product indicated.

Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PRODUCTS**Vacuum Breakers**

Pipe-Applied, Atmospheric-Type Vacuum Breakers:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Febco, Industries, Inc.

Watts Industries, Inc.; Water Products Div.

Zurn Plumbing Products Group; Wilkins Div.

Standard: ASSE 1001.

Size: NPS 1/4 to NPS 3, as required to match connected piping.

Body: Bronze.

Inlet and Outlet Connections: Threaded.

Finish: Rough bronze.

Hose-Connection Vacuum Breakers:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Febco, Inc.

1 MIFAB, Inc.
 2 Watts Industries, Inc.; Water Products Div.
 3 Zurn Plumbing Products Group; Wilkins Div.
 4 Standard: ASSE 1011.
 5 Body: Bronze, nonremovable, with manual drain.
 6 Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 7 Finish: Rough bronze.
 8 Pressure Vacuum Breakers:
 9 Manufacturers: Subject to compliance with requirements, provide products by one of the
 10 following:
 11 Febco, Inc.
 12 Watts Industries, Inc.; Water Products Div.
 13 Zurn Plumbing Products Group; Wilkins Div.
 14 Standard: ASSE 1020.
 15 Operation: Continuous-pressure applications.
 16 Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
 17 Valves: Ball type, on inlet and outlet.

19 Backflow Preventers

20 Reduced-Pressure-Principle Backflow Preventers:
 21 Basis-of-Design Product: Subject to compliance with requirements, provide the product
 22 indicated on Drawings or a comparable product by one of the following:
 23 Febco, Inc.
 24 Zurn Plumbing Products Group; Wilkins Div.
 25 Watts Industries, Inc.; Water Products Div.
 26 Standard: ASSE 1013.
 27 Operation: Continuous-pressure applications.
 28 Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
 29 Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or
 30 that is FDA approved.
 31 End Connections: Threaded for NPS 2 and smaller.
 32 Configuration: Designed for horizontal, straight through flow.
 33 Accessories:
 34 Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller.
 35 Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
 36 Backflow-Preventer Test Kits:
 37 Basis-of-Design Product: Subject to compliance with requirements, provide the product
 38 indicated on Drawings or a comparable product by one of the following:
 39 FEBCO; SPX Valves & Controls.
 40 Watts Industries, Inc.; Water Products Div.
 41 Zurn Plumbing Products Group; Wilkins Div.
 42 Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-
 43 procedure instructions.

45 Water Pressure-Reducing Valves

46 Water Regulators:
 47 Manufacturers: Subject to compliance with requirements, provide products by one of the
 48 following:

1 Febco, Inc.
 2 Watts Industries, Inc.; Water Products Div.
 3 Zurn Plumbing Products Group; Wilkins Div.
 4 Standard: ASSE 1003.
 5 Pressure Rating: Initial working pressure of 150 psig.
 6 Design Inlet Pressure: 80 psig.
 7 Design Outlet Pressure Setting: 60 psig.
 8 Body: Bronze for NPS 2 and smaller.
 9 End Connections: Threaded for NPS 2 and smaller.

10

11 Balancing Valves

12 Copper-Alloy Calibrated Balancing Valves:
 13 Manufacturers: Subject to compliance with requirements, provide products by one of the
 14 following:
 15 Armstrong International, Inc.
 16 ITT Industries; Bell & Gossett Div.
 17 Tour and Anderson
 18 Type: Ball valve with two readout ports and memory setting indicator.
 19 Body: bronze,
 20 Size: Same as connected piping, but not larger than NPS 2.
 21 Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.
 22 Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

23

24 Strainers For Domestic Water Piping

25 Y-Pattern Strainers:
 26 Pressure Rating: 125 psig minimum, unless otherwise indicated.
 27 Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or
 28 FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
 29 End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 30 Screen: Stainless steel with round perforations, unless otherwise indicated.
 31 Perforation Size:
 32 Strainers NPS 2 and Smaller: 0.020 inch>.
 33 Strainers NPS 2-1/2 to NPS 4: 0.045 inch>.
 34 Drain: Factory-installed, hose-end drain valve.

35

36 Hose Bibbs

37 Hose Bibbs:
 38 Standard: ASME A112.18.1 for sediment faucets.
 39 Body Material: Bronze.
 40 Seat: Bronze, replaceable.
 41 Supply Connections: NPS 3/4 threaded or solder-joint inlet.
 42 Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
 43 Pressure Rating: 125 psig.
 44 Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker
 45 complying with ASSE 1011.
 46 Finish for Equipment Rooms: Rough bronze.
 47 Finish for Service Areas: Rough bronze.
 48 Finish for Finished Rooms: Chrome or nickel plated.

- 1 Operation for Equipment Rooms: Wheel handle or operating key.
 2 Operation for Service Areas: Operating key.
 3 Operation for Finished Rooms: Operating key.
 4 Include operating key with each operating-key hose bibb.
 5 Include integral wall flange with each chrome- or nickel-plated hose bibb.
 6

7 Wall Hydrants

8 Nonfreeze Wall Hydrants:
 9 Manufacturers: Subject to compliance with requirements, provide products by one of the
 10 following:

- 11 Josam Company.
 12 MIFAB, Inc.
 13 Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 14 Tyler Pipe; Wade Div.
 15 Watts Drainage Products Inc.
 16 Woodford Manufacturing Company.
 17 Zurn Plumbing Products Group; Specification Drainage Operation.

18 Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.

19 Pressure Rating: 125 psig.

20 Operation: Loose key.

21 Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.

22 Inlet: NPS 3/4.

23 Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with
 24 ASME B1.20.7.

25 Box: Deep, flush mounting with cover.

26 Box and Cover Finish: Polished nickel bronze.

27 Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with
 28 ASME B1.20.7.

29 Nozzle and Wall-Plate Finish: Polished nickel bronze.

30 Operating Keys(s): Two with each wall hydrant.
 31

32 Drain Valves

33 Ball-Valve-Type, Hose-End Drain Valves:

34 Standard: MSS SP-110 for standard-port, two-piece ball valves.

35 Pressure Rating: 400-psig minimum CWP.

36 Size: NPS 3/4.

37 Body: Copper alloy.

38 Ball: Chrome-plated brass.

39 Seats and Seals: Replaceable.

40 Handle: Vinyl-covered steel.

41 Inlet: Threaded or solder joint.

42 Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap
 43 with brass chain.
 44

45 Water Hammer Arresters

46 Water Hammer Arresters:

47 Manufacturers: Subject to compliance with requirements, provide products by one of the
 48 following:

- 1 AMTROL, Inc.
 2 Josam Company.
 3 MIFAB, Inc.
 4 PPP Inc.
 5 Sioux Chief Manufacturing Company, Inc.
 6 Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 7 Tyler Pipe; Wade Div.
 8 Watts Drainage Products Inc.
 9 Zurn Plumbing Products Group; Specification Drainage Operation.
 10 Standard: ASSE 1010 or PDI-WH 201.
 11 Type: Copper tube with piston.
 12 Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

13

14 EXECUTION

15

16 Installation

- 17 Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining
 18 materials, joint construction, and basic installation requirements.
 19 Install backflow preventers in each water supply to mechanical equipment and systems and to
 20 other equipment and water systems that may be sources of contamination. Comply with
 21 authorities having jurisdiction.
 22 Locate backflow preventers in same room as connected equipment or system.
 23 Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting,
 24 fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in
 25 drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow
 26 preventer. Simple air breaks are not acceptable for this application.
 27 Do not install bypass piping around backflow preventers.
 28 Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and
 29 outlet.
 30 Install balancing valves in locations where they can easily be adjusted.
 31 Install Y-pattern strainers for water on supply side of each water pressure-reducing valve and
 32 solenoid valve.
 33 Install outlet boxes recessed in wall. Install 2-by-4-inch fire-retardant-treated-wood blocking
 34 wall reinforcement between studs.
 35 Install water hammer arresters in water piping according to PDI-WH 201.
 36 Install air vents at high points of water piping. Install drain piping and discharge onto floor drain.

37

38 Labeling And Identifying

- 39 Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or
 40 sign on or near each of the following:
 41 Reduced-pressure-principle backflow preventers.
 42 Double-check, detector-assembly backflow preventers.

43

44 Field Quality Control

- 45 Perform the following tests and prepare test reports:
 46 Test each reduced-pressure-principle backflow preventer and double-check, detector-assembly
 47 backflow preventer according to authorities having jurisdiction and the device's reference
 48 standard.

1910

1 Remove and replace malfunctioning domestic water piping specialties and retest as specified

2

3 Adjusting

4 Set field-adjustable pressure set points of water pressure-reducing valves.

5 Set field-adjustable flow set points of balancing valves.

6

7 END OF SECTION

1 SECTION 22 1316 - SANITARY WASTE AND VENT PIPING

2

3 GENERAL

4

5 Summary

6 This Section includes the following for soil, waste, and vent piping inside the building:

7 Pipe, tube, and fittings.

8 Special pipe fittings.

9 Encasement for underground metal piping.

10

11 Performance Requirements

12 Components and installation shall be capable of withstanding the following minimum working
13 pressure, unless otherwise indicated:

14 Soil, Waste, and Vent Piping: 10-foot head of water.

15 Sanitary Sewer, Force-Main Piping: 50 psig.

16

17 Submittals

18 Product Data: For pipe, tube, fittings, and couplings.

19

20 PRODUCTS

21

22 Manufacturers

23 In other Part 31 articles where titles below introduce lists, the following requirements apply to
24 product selection:

25 Manufacturers: Subject to compliance with requirements, provide products by one of
26 the manufacturers specified.

27

28 Piping Materials

29 Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining
30 materials.

31

32 Hub-And-Spigot, Cast-Iron Soil Pipe And Fittings

33 Pipe and Fittings: ASTM A 74, Service class.

34 Gaskets: ASTM C 564, rubber.

35 Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

36

37 Hubless Cast-Iron Soil Pipe And Fittings

38 Pipe and Fittings: ASTM A 888 or CISPI 301.

39 Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant
40 fasteners, and rubber sleeve with integral, center pipe stop.

41 Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated
42 shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

43 Manufacturers:

44 ANACO.

45 Fernco, Inc.

46 Ideal Div.; Stant Corp.

47 Mission Rubber Co.

48 Tyler Pipe; Soil Pipe Div.

1 Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-
 2 steel bands and tightening devices, and ASTM C 564, rubber sleeve.

3 Manufacturers:

4 ANACO.

5 Clamp-All Corp.

6 Ideal Div.; Stant Corp.

7 Mission Rubber Co.

8 Tyler Pipe; Soil Pipe Div.

9
 10 EXECUTION

11
 12 Excavation

13 Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

14
 15 Piping Applications

16 Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

17 Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

18 Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

19 Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings;
 20 and hubless-coupling joints.

21 Aboveground, vent piping NPS 4 and smaller shall be any of the following:

22 Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

23 Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings;
 24 and hubless-coupling joints.

25 Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

26 Service class, cast-iron soil piping; and gasketed joints.

27 Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings;
 28 and hubless-coupling joints.

29 Aboveground sanitary-sewage force mains NPS 2-1/2 to NPS 6 shall be the following:

30 Hard copper tube, Type L; copper pressure fittings; and soldered joints.

31 Underground sanitary-sewage force mains NPS 4 and smaller shall be the following:

32 Soft copper tube, Type L; wrought-copper pressure fittings; and soldered joints.

33
 34 Piping Installation

35 Install cleanouts at grade and extend to where building sanitary drains connect to building
 36 sanitary sewers.

37 Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

38 Install underground, copper, force-main tubing according to CDA's "Copper Tube Handbook."

39 Install encasement on piping according to ASTM A 674 or AWWA C105.

40 Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe
 41 penetration through foundation wall. Select number of interlocking rubber links required to
 42 make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22
 43 Section "Basic Mechanical Materials and Methods."

44 Install wall-penetration fitting at each service pipe penetration through foundation wall. Make
 45 installation watertight.

46 Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook,"
 47 Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

48 Install encasement on underground piping according to ASTM A 674 or AWWA C105.

1 Make changes in direction for soil and waste drainage and vent piping using appropriate
 2 branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used
 3 on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn,
 4 double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with
 5 common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not
 6 change direction of flow more than 90 degrees. Use proper size of standard increasers and
 7 reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction
 8 of flow is prohibited.

9 Lay buried building drainage piping beginning at low point of each system. Install true to grades
 10 and alignment indicated, with unbroken continuity of invert. Place hub ends of piping
 11 upstream. Install required gaskets according to manufacturer's written instructions for use of
 12 lubricants, cements, and other installation requirements. Maintain swab in piping and pull past
 13 each joint as completed.

14 Install soil and waste drainage and vent piping at the following minimum slopes, unless
 15 otherwise indicated:

16 Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and
 17 smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.

18 Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.

19 Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

20 Do not enclose, cover, or put piping into operation until it is inspected and approved by
 21 authorities having jurisdiction.

22 Provide sleeve at all floor penetrations. Provide flex connection and anchor that will show a
 23 min. of 1" pipe movement from expansive soils- every pipe passing thru basement and first
 24 floor.

25 Joint Construction

26 Basic piping joint construction requirements are specified in Division 22 Section "Basic
 27 Mechanical Materials and Methods."

28 Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil
 29 Pipe and Fittings Handbook" for compression joints.

30 Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and
 31 Fittings Handbook" for hubless-coupling joints.

32 Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy
 33 solder; and ASTM B 828 procedure, unless otherwise indicated.

34 Valve Installation

35 General valve installation requirements are specified in Division 22 Section "Valves."

36 Shutoff Valves: Install shutoff valve on each sewage pump discharge.

37 Install full-port ball valve for piping NPS 2 and smaller.

38 Install gate valve for piping NPS 2-1/2 and larger.

39 Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage
 40 pump discharge.

41 Hanger And Support Installation

42 Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install
 43 the following:

44 Vertical Piping: MSS Type 8 or Type 42, clamps.

45 Install individual, straight, horizontal piping runs according to the following:

1 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

2 Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3 Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls.
4 Support pipe rolls on trapeze.

5 Base of Vertical Piping: MSS Type 52, spring hangers.

6 Install supports according to Division 22 Section "Hangers and Supports."

7 Support vertical piping and tubing at base and at each floor.

8 Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

9 Install hangers for cast-iron soil piping with the following maximum horizontal spacing and
10 minimum rod diameters:

11 NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.

12 NPS 3: 60 inches with 1/2-inch rod.

13 NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

14 Install supports for vertical cast-iron soil piping every 15 feet.

15 Install supports for vertical stainless-steel piping every 10 feet.

16 Install hangers for copper tubing with the following maximum horizontal spacing and minimum
17 rod diameters:

18 NPS 1-1/4: 72 inches with 3/8-inch rod.

19 NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

20 NPS 2-1/2: 108 inches with 1/2-inch rod.

21 NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

22 NPS 6: 10 feet with 5/8-inch rod.

23 NPS 8: 10 feet with 3/4-inch rod.

24 Install supports for vertical copper tubing every 10 feet.

25 Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written
26 instructions.

27 Connections

28 Drawings indicate general arrangement of piping, fittings, and specialties.

29 Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join
30 dissimilar piping materials.

31 Connect drainage and vent piping to the following:

32 Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than
33 required by plumbing code.

34 Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated,
35 but not smaller than required by authorities having jurisdiction.

36 Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not
37 smaller than required by plumbing code.

38 Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated,
39 and union for each connection. Use flanges instead of unions for connections NPS 2-1/2
40 and larger.

41 Connect force-main piping to the following:

42 Sanitary Sewer: To exterior force main or sanitary manhole.

43 Sewage Pumps: To sewage pump discharge.

44 Field Quality Control

45 During installation, notify authorities having jurisdiction at least 24 hours before inspection must
46 be made. Perform tests specified below in presence of authorities having jurisdiction.

1 Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in
2 after roughing-in and before setting fixtures.

3 Final Inspection: Arrange for final inspection by authorities having jurisdiction to
4 observe tests specified below and to ensure compliance with requirements.

5 Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection,
6 make required corrections and arrange for reinspection.

7 Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

8 Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction
9 or, in absence of published procedures, as follows:

10 Test for leaks and defects in new piping and parts of existing piping that have been
11 altered, extended, or repaired. If testing is performed in segments, submit separate
12 report for each test, complete with diagram of portion of piping tested.

13 Leave uncovered and unconcealed new, altered, extended, or replaced drainage and
14 vent piping until it has been tested and approved. Expose work that was covered or
15 concealed before it was tested.

16 Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside
17 leaders, on completion of roughing-in. Close openings in piping system and fill with
18 water to point of overflow, but not less than 10-foot head of water. From 15 minutes
19 before inspection starts to completion of inspection, water level must not drop. Inspect
20 joints for leaks.

21 Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps
22 filled with water, test connections and prove they are gastight and watertight. Plug
23 vent-stack openings on roof and building drains where they leave building. Introduce air
24 into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in
25 trap of water closet to measure this pressure. Air pressure must remain constant
26 without introducing additional air throughout period of inspection. Inspect plumbing
27 fixture connections for gas and water leaks.

28 Repair leaks and defects with new materials and retest piping, or portion thereof, until
29 satisfactory results are obtained.

30 Prepare reports for tests and required corrective action.

31 Test force-main piping according to procedures of authorities having jurisdiction or, in absence
32 of published procedures, as follows:

33 Leave uncovered and unconcealed new, altered, extended, or replaced force-main
34 piping until it has been tested and approved. Expose work that was covered or
35 concealed before it was tested.

36 Cap and subject piping to static-water pressure of 50 psig above operating pressure,
37 without exceeding pressure rating of piping system materials. Isolate test source and
38 allow to stand for four hours. Leaks and loss in test pressure constitute defects that
39 must be repaired.

40 Repair leaks and defects with new materials and retest piping, or portion thereof, until
41 satisfactory results are obtained.

42 Prepare reports for tests and required corrective action.

43 44 Cleaning

45 Clean interior of piping. Remove dirt and debris as work progresses.

46 Protect drains during remainder of construction period to avoid clogging with dirt and debris
47 and to prevent damage from traffic and construction work.

48 Place plugs in ends of uncompleted piping at end of day and when work stops.

1910

1 END OF SECTION

1 SECTION 22 14 13 - STORM DRAINAGE PIPING

2
3 GENERAL

4
5 Summary

6 This Section includes the following storm drainage piping inside the building:

7 Pipe, tube, and fittings.

8 Special pipe fittings.

9
10 Performance Requirements

11 Components and installation shall be capable of withstanding the following minimum working-
12 pressure, unless otherwise indicated:

13 Storm Drainage Piping: 10-foot head of water.

14
15 Submittals

16 Product Data: For pipe, tube, fittings, and couplings.

17
18 PRODUCTS

19
20 Manufacturers

21 In other Part 2 articles where titles below introduce lists, the following requirements apply to
22 product selection:

23 Manufacturers: Subject to compliance with requirements, provide products by one of
24 the manufacturers specified.

25
26 Piping Materials

27 Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining
28 materials.

29
30 Hub-And-Spigot, Cast-Iron Soil Pipe And Fittings

31 Pipe and Fittings: ASTM A 74, Service class.

32 Gaskets: ASTM C 564, rubber.

33 Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

34
35 Hubless Cast-Iron Soil Pipe And Fittings

36 Pipe and Fittings: ASTM A 888 or CISPI 301.

37 Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant
38 fasteners, and rubber sleeve with integral, center pipe stop.

39 Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-
40 steel bands and tightening devices, and ASTM C 564, rubber sleeve.

41 Manufacturers:

42 ANACO.

43 Clamp-All Corp.

44 Ideal Div.; Stant Corp.

45 Mission Rubber Co.

46 Tyler Pipe; Soil Pipe Div.

1 Special Pipe Fittings

2 Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing
3 sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with
4 AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and
5 steel bolts.

6 Manufacturers:

7 SIGMA Corp.
8

9 EXECUTION

10 Excavation

11 Refer to Division 31 Section "Earthwork" for excavating, trenching, and backfilling.
12

13 Piping Applications

14 Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

15 Aboveground storm drainage piping NPS 6 and smaller shall be any of the following:

16 Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

17 Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and
18 coupled joints.

19 Aboveground, storm drainage piping NPS 8 and larger shall be any of the following:

20 Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

21 Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and
22 coupled joints.

23 Underground storm drainage piping NPS 6 and smaller shall be any of the following:

24 Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

25 Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and
26 coupled joints.

27 Underground, storm drainage piping NPS 8 and larger shall be any of the following:

28 Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

29 Hubless cast-iron soil pipe and fittings; heavy-duty shielded, cast-iron couplings; and
30 coupled joints.
31

32 Piping Installation

33 Install cleanouts at grade and extend to where building storm drains connect to building storm
34 sewers. Cleanouts are specified in Division 22 Section "Plumbing Specialties."

35 Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.

36 Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe
37 penetration through foundation wall. Select number of interlocking rubber links required to
38 make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22
39 Section "Basic Mechanical Materials and Methods."

40 Install wall-penetration fitting system at each service pipe penetration through foundation wall.

41 Make installation watertight.

42 Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook,"
43 Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

44 Make changes in direction for storm drainage piping using appropriate branches, bends, and
45 long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of
46 standard increasers and reducers if pipes of different sizes are connected. Reducing size of
47 drainage piping in direction of flow is prohibited.

1 Lay buried building storm drainage piping beginning at low point of each system. Install true to
2 grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping
3 upstream. Install required gaskets according to manufacturer's written instructions for use of
4 lubricants, cements, and other installation requirements. Maintain swab in piping and pull past
5 each joint as completed.

6 Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

7 Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and
8 smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.

9 Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

10 Do not enclose, cover, or put piping into operation until it is inspected and approved by
11 authorities having jurisdiction.

12 Provide sleeve at all floor penetrations. Provide flex connection and anchor that will show a
13 min. of 1" inch pipe movement from expansive soils – every pipe passing thru basement and
14 first floor.

15 Joint Construction

17 Basic piping joint construction requirements are specified in Division 22 Section "Basic
18 Mechanical Materials and Methods."

19 Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil
20 Pipe and Fittings Handbook" for compression joints.

21 Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron
22 Soil Pipe and Fittings Handbook" for hubless-coupling joints.

23 Hanger And Support Installation

24 Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install
25 the following:

26 Vertical Piping: MSS Type 8 or Type 42, clamps.

27 Individual, Straight, Horizontal Piping Runs: According to the following:

28 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

29 Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

30 Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls.
31 Support pipe rolls on trapeze.

32 Base of Vertical Piping: MSS Type 52, spring hangers.

33 Install supports according to Division 22 Section "Hangers and Supports."

34 Support vertical piping and tubing at base and at each floor.

35 Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

36 Install hangers for cast-iron soil piping with the following maximum horizontal spacing and
37 minimum rod diameters:

38 NPS 3: 60 inches with 1/2-inch rod.

39 NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

40 NPS 6: 60 inches with 3/4-inch rod.

41 NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

42 Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to
43 60 inches.

44 Install supports for vertical cast-iron soil piping every 15 feet.

45 Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written
46 instructions.
47

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40

Connections

Drawings indicate general arrangement of piping, fittings, and specialties.
Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
Connect storm drainage piping to roof drains and storm drainage specialties.

Field Quality Control

During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.

Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

Test Procedure: Test storm drainage piping, outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

Prepare reports for tests and required corrective action.

Cleaning

Clean interior of piping. Remove dirt and debris as work progresses.

Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

1 SECTION 22 1423 - STORM DRAINAGE PIPING SPECIALTIES

2
3 GENERAL

4
5 Summary

6 This Section includes the following storm drainage piping specialties:

- 7 Cleanouts.
- 8 Trench drains.
- 9 Through-penetration firestop assemblies.
- 10 Roof drains.
- 11 Miscellaneous storm drainage piping specialties.
- 12 Flashing materials.

13
14 Submittals

15 Product Data: For each type of product indicated.

16
17 Quality Assurance

18 Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

19
20 Coordination

21 Coordinate size and location of roof penetrations.

22
23 PRODUCTS

24
25 Cleanouts

26 Exposed Metal Cleanouts:

27 Manufacturers: Subject to compliance with requirements, provide products by one of
28 the following:

- 29 Josam Company; Josam Div.
- 30 MIFAB, Inc.
- 31 Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
- 32 Tyler Pipe; Wade Div.
- 33 Watts Drainage Products Inc.
- 34 Zurn Plumbing Products Group; Specification Drainage Operation.

35 Standard: ASME A112.36.2M for cast iron for cleanout test tee.

36 Size: Same as connected drainage piping

37 Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match
38 connected piping.

39 Closure: Countersunk or raised-head, brass plug.

40 Closure Plug Size: Same as or not more than one size smaller than cleanout size.

41 Closure: Stainless-steel plug with seal.

42
43 Through-Penetration Firestop Assemblies

44 Through-Penetration Firestop Assemblies:

45 Available Manufacturers: Subject to compliance with requirements, manufacturers
46 offering products that may be incorporated into the Work include, but are not limited
47 to, the following:

1 Manufacturers: Subject to compliance with requirements, provide products by one of
2 the following:

3 ProSet Systems Inc.

4 Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.

5 Size: Same as connected pipe.

6 Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing
7 flange on one end for installation in cast-in-place concrete slabs.

8 Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene
9 O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap
10 for plug.

11 Special Coating: Corrosion resistant on interior of fittings.

12 Roof Drains

13 Metal Roof Drains:

14 Basis-of-Design Product: Subject to compliance with requirements, provide the product
15 indicated on Drawings or a comparable product by one of the following:

16 Josam Company; Josam Div.

17 MIFAB, Inc.

18 Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

19 Tyler Pipe; Wade Div.

20 Watts Drainage Products Inc.

21 Zurn Plumbing Products Group; Specification Drainage Operation.

22 Standard: ASME A112.21.2M.

23 Pattern: Roof drain.

24 Body Material: Cast iron.

25 Combination Flashing Ring and Gravel Stop: Required.

26 Outlet: Bottom.

27 Dome Material: Cast iron.

28 Extension Collars: Required.

29 Underdeck Clamp: Required.

30 Miscellaneous Storm Drainage Piping Specialties

31 Downspout Boots:

32 Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for
33 attaching to building; NPS 4 outlet; and shop-applied bituminous coating.

34 Size: Inlet size to match downspout.

35 Description: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.

36 Size: Same as or larger than connected downspout.

37 Conductor Nozzles:

38 Description: Bronze body with threaded inlet and bronze wall flange with mounting
39 holes.

40 Size: Same as connected conductor.

41 Flashing Materials

42 Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch
43 minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-
44 phosphatized finish for painting if indicated.

1 Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum
2 thickness.

3 Fasteners: Metal compatible with material and substrate being fastened.

4 Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units
5 required for installation; matching or compatible with material being installed.

6 Solder: ASTM B 32, lead-free alloy.

7 Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.
8

9 EXECUTION

10 Installation

11 Refer to Division 22 Section "Basic Mechanical Materials and Methods" for piping joining
12 materials, joint construction, and basic installation requirements.

13 Install cleanouts in aboveground piping and building drain piping according to the following,
14 unless otherwise indicated:

15 Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless
16 larger cleanout is indicated.

17 Locate at each change in direction of piping greater than 45 degrees.

18 Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for
19 larger piping.

20 Locate at base of each vertical soil and waste stack.

21 For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated,
22 with frame and cover flush with finished wall.

23 Assemble plastic channel drainage system components according to manufacturer's written
24 instructions. Install on support devices so that top will be flush with adjacent surface.

25 Install through-penetration firestop assemblies in plastic conductors at floor penetrations.

26 Install roof drains at low points of roof areas according to roof membrane manufacturer's
27 written installation instructions. Roofing materials are specified in Division 7.

28 Install roof-drain flashing collar or flange so that there will be no leakage between drain
29 and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

30 Position roof drains for easy access and maintenance.

31 Install sleeve flashing device with each riser and stack passing through floors with waterproof
32 membrane.

33 Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and
34 within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding
35 pipe fittings.
36

37 Connections

38 Piping installation requirements are specified in other Division 15 Sections. Drawings indicate
39 general arrangement of piping, fittings, and specialties.
40

41 Flashing Installation

42 Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors
43 and roofs with waterproof membrane.

44 Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and
45 skirt or flange extending at least 8 inches around pipe.

46 Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around
47 sleeve.
48

- 1 Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches
- 2 around specialty.
- 3 Set flashing on floors and roofs in solid coating of bituminous cement.
- 4 Secure flashing into sleeve and specialty clamping ring or device.
- 5 Fabricate and install flashing and pans, sumps, and other drainage shapes.
- 6

7 Protection

- 8 Protect drains during remainder of construction period to avoid clogging with dirt or debris and
- 9 to prevent damage from traffic or construction work.
- 10 Place plugs in ends of uncompleted piping at end of each day or when work stops.
- 11

12 END OF SECTION

1 SECTION 22 4000 - PLUMBING FIXTURES

2
3 GENERAL

4
5 Related Documents

6 Drawings and general provisions of the Contract, including General and Supplementary
7 Conditions and Division 01 Specification Sections, apply to this Section.

8
9 Summary

10 This Section includes the following conventional plumbing fixtures and related components:

11 Faucets for lavatories, showers and sinks.

12 Toilet seats.

13 Protective shielding guards.

14 Fixture supports.

15 Shower receptors.

16 Water closets.

17 Urinals.

18 Lavatories.

19 Commercial sinks.

20 Individual showers.

21 Service sinks.

22 Related Sections include the following:

23 Division 10 Section "Toilet, Bath, and Laundry Accessories."

24 Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor
25 drains, and specialty fixtures not included in this Section.

26
27 Definitions

28 ABS: Acrylonitrile-butadiene-styrene plastic.

29 Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with
30 disabilities.

31 Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble
32 and solid-surface materials.

33 Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

34 Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings
35 specified in this Section include supplies and stops, faucets and spouts, shower heads and tub
36 spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are
37 included where indicated.

38 FRP: Fiberglass-reinforced plastic.

39 PMMA: Polymethyl methacrylate (acrylic) plastic.

40 PVC: Polyvinyl chloride plastic.

41 Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-,
42 scratch-, and stain-resistance qualities.

43
44 Submittals

45 Product Data: For each type of plumbing fixture indicated. Include selected fixture and
46 trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate
47 materials and finishes, dimensions, construction details, and flow-control rates.

48 Shop Drawings: Diagram power, signal, and control wiring.

1 Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation,
2 and maintenance manuals.

3 Warranty: Special warranty specified in this Section.
4

5 Quality Assurance

6 Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category
7 through one source from a single manufacturer.

8 Exception: If fixtures, faucets, or other components are not available from a single
9 manufacturer, obtain similar products from other manufacturers specified for that
10 category.

11 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70,
12 Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for
13 intended use.

14 Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable
15 Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public
16 Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with
17 disabilities.

18 Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy
19 Act," about water flow and consumption rates for plumbing fixtures.

20 NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects,"
21 for fixture materials that will be in contact with potable water.

22 Select combinations of fixtures and trim, faucets, fittings, and other components that are
23 compatible.

24 Comply with the following applicable standards and other requirements specified for plumbing
25 fixtures:

26 Enameled, Cast-Iron Fixtures: ASME A112.19.1M.

27 Plastic Laundry Trays: ANSI Z124.6.

28 Plastic Shower Enclosures: ANSI Z124.2.

29 Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.

30 Slip-Resistant Bathing Surfaces: ASTM F 462.

31 Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.

32 Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.

33 Stainless-Steel Residential Sinks: ASME A112.19.3.

34 Vitreous-China Fixtures: ASME A112.19.2M.

35 Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

36 Comply with the following applicable standards and other requirements specified for lavatory
37 and sink faucets:

38 Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.

39 Faucets: ASME A112.18.1.

40 Hose-Connection Vacuum Breakers: ASSE 1011.

41 Hose-Coupling Threads: ASME B1.20.7.

42 Integral, Atmospheric Vacuum Breakers: ASSE 1001.

43 NSF Potable-Water Materials: NSF 61.

44 Pipe Threads: ASME B1.20.1.

45 Sensor-Actuated Faucets and Electrical Devices: UL 1951.

46 Supply Fittings: ASME A112.18.1.

47 Brass Waste Fittings: ASME A112.18.2.

48 Comply with the following applicable standards and other requirements specified for shower

- 1 faucets:
- 2 Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
- 3 Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets:
- 4 ASSE 1016.
- 5 Deck-Mounted Bath/Shower Transfer Valves: ASME 18.7.
- 6 Faucets: ASME A112.18.1.
- 7 Hand-Held Showers: ASSE 1014.
- 8 High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
- 9 Hose-Coupling Threads: ASME B1.20.7.
- 10 Manual-Control Antiscald Faucets: ASTM F 444.
- 11 Pipe Threads: ASME B1.20.1.
- 12 Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- 13 Sensor-Actuated Faucets and Electrical Devices: UL 1951.
- 14 Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
- 15 Comply with the following applicable standards and other requirements specified for
- 16 miscellaneous fittings:
- 17 Atmospheric Vacuum Breakers: ASSE 1001.
- 18 Brass and Copper Supplies: ASME A112.18.1.
- 19 Plastic Tubular Fittings: ASTM F 409.
- 20 Brass Waste Fittings: ASME A112.18.2.
- 21 Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
- 22 Comply with the following applicable standards and other requirements specified for
- 23 miscellaneous components:
- 24 Disposers: ASSE 1008 and UL 430.
- 25 Flexible Water Connectors: ASME A112.18.6.
- 26 Floor Drains: ASME A112.6.3.
- 27 Grab Bars: ASTM F 446.
- 28 Hose-Coupling Threads: ASME B1.20.7.
- 29 Off-Floor Fixture Supports: ASME A112.6.1M.
- 30 Pipe Threads: ASME B1.20.1.
- 31 Plastic Toilet Seats: ANSI Z124.5.
- 32 Supply and Drain Protective Shielding Guards: ICC A117.1.

34 Warranty

- 35 Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or
- 36 replace components of whirlpools that fail in materials or workmanship within specified
- 37 warranty period.
- 38 Failures include, but are not limited to, the following:
- 39 Structural failures of unit shell.
- 40 Faulty operation of controls, blowers, pumps, heaters, and timers.
- 41 Deterioration of metals, metal finishes, and other materials beyond normal use.
- 42 Warranty Period for Commercial Applications: One year(s) from date of Substantial
- 43 Completion.

45 Extra Materials

- 46 Furnish extra materials described below that match products installed and that are packaged
- 47 with protective covering for storage and identified with labels describing contents.
- 48 Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size

- 1 installed.
2 Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size
3 installed.
4 Provide hinged-top wood or metal box, or individual metal boxes, with separate
5 compartments for each type and size of extra materials listed above.
6 Toilet Seats: Equal to 5 percent of amount of each type installed.
7

8 PRODUCTS

9 10 11 Lavatory Faucets

12 Lavatory Faucets: See Plumbing Fixture Schedule for Details
13

14 Shower Faucets

15 Lavatory Faucets: See Plumbing Fixture Schedule for Details
16

17 Sink Faucets

18 Sink Faucets: See Plumbing Fixture Schedule for Details
19

20 Flushometers

21 Flushometers: See Plumbing Fixture Schedule for Details
22

23 Toilet Seats

24 Toilet Seats: See Plumbing Fixture Schedule for Details
25

26 Protective Shielding Guards

27 Protective Shielding Pipe Covers: See Plumbing Fixture Schedule for Details
28

29 Fixture Supports

30 Fixture Supports: See Plumbing Fixture Schedule for Details
31

32 Water Closets

33 Water Closets: See Plumbing Fixture Schedule for Details
34

35 Urinals

36 Urinals: See Plumbing Fixture Schedule for Details
37

38 Lavatories

39 Lavatories: See Plumbing Fixture Schedule for Details
40

41 Commercial Sinks

42 Commercial Sinks: See Plumbing Fixture Schedule for Details
43

44 Individual Showers

45 Individual Showers: See Plumbing Fixture Schedule for Details
46

47 Service Basins

48 Service Basins: See Plumbing Fixture Schedule for Details

1 PART 3 - EXECUTION

2
3 Examination

4 Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify
5 actual locations of piping connections before plumbing fixture installation.

6 Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be
7 installed.

8 Proceed with installation only after unsatisfactory conditions have been corrected.
9

10 Installation

11 Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers'
12 written instructions.

13 Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

14 Use carrier supports with waste fitting and seal for back-outlet fixtures.

15 Use carrier supports without waste fitting for fixtures with tubular waste piping.

16 Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

17 Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

18 Install floor-mounting fixtures on closet flanges or other attachments to piping or building
19 substrate.

20 Install wall-mounting fixtures with tubular waste piping attached to supports.

21 Install counter-mounting fixtures in and attached to casework.

22 Install fixtures level and plumb according to roughing-in drawings.

23 Install water-supply piping with stop on each supply to each fixture to be connected to water
24 distribution piping. Attach supplies to supports or substrate within pipe spaces behind
25 fixtures. Install stops in locations where they can be easily reached for operation.

26 Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture.

27 Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

28 Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to
29 sanitary drainage system.

30 Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage
31 system.

32 Install flushometer valves for accessible water closets and urinals with handle mounted on wide
33 side of compartment. Install other actuators in locations that are easy for people with
34 disabilities to reach.

35 Install toilet seats on water closets.

36 Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are
37 not available with required rates and patterns. Include adapters if required.

38 Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop
39 valves.

40 Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if
41 faucets are not available with required rates and patterns. Include adapters if required.

42 Install shower flow-control fittings with specified maximum flow rates in shower arms.

43 Install traps on fixture outlets.

44 Exception: Omit trap on fixtures with integral traps.

45 Exception: Omit trap on indirect wastes, unless otherwise indicated.

46 Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within
47 cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding
48 fittings. Escutcheons are specified in Division 22 Section "Common Work Results for

1 Plumbing."

2 Set shower receptors and service basin in leveling bed of cement grout.

3 Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part,
4 mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified
5 in Division 07 Section "Joint Sealants."
67 Connections8 Piping installation requirements are specified in other Division 22 Sections. Drawings indicate
9 general arrangement of piping, fittings, and specialties.10 Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent
11 piping. Use size fittings required to match fixtures.12 Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical
13 Systems."14 Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and
15 Cables."
1617 Field Quality Control18 Verify that installed plumbing fixtures are categories and types specified for locations where
19 installed.20 Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified
21 components.

22 Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

23 Test installed fixtures after water systems are pressurized for proper operation. Replace
24 malfunctioning fixtures and components, then retest. Repeat procedure until units operate
25 properly.26 Install fresh batteries in sensor-operated mechanisms.
2728 Adjusting29 Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures,
30 fittings, and controls.

31 Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

32 Replace washers and seals of leaking and dripping faucets and stops.

33 Install fresh batteries in sensor-operated mechanisms.
3435 Cleaning36 Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods
37 and materials. Do the following:38 Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers
39 and spouts.

40 Remove sediment and debris from drains.

41 After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect
42 exposed finishes and repair damaged finishes.
43
4445 Protection

46 Provide protective covering for installed fixtures and fittings.

47 Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by
48 Owner.

1910

1 END OF SECTION

1 SECTION 23 0100 - MECHANICAL GENERAL PROVISIONS-HVAC

2
3 GENERAL

4
5 Related Documents

6 The General Conditions, Special Conditions and Contract Documents are part of these
7 specifications. Consult them further instructions and be governed by the requirements
8 thereunder.
9

10 Description

11 Work Included

12 Furnish all labor and materials and perform all operations necessary for the installation
13 of complete and operating mechanical systems subject to the conditions of the contract.
14 The work also includes the completion of such mechanical and electrical details not
15 mentioned or shown which are necessary for the successful operation of all systems;
16 this includes the furnishing of all materials for filling systems to make them operable,
17 including water, refrigerant, oil, grease, antifreeze and brine. Prove satisfactory
18 operation of all equipment and controls to the MECHANICAL ENGINEER on request.

19 Work Not Included

20 Certain labor and materials may be furnished and/or installed under other divisions of
21 these specifications. Coordinate with other trades and arrange the work to make the
22 parts fit together. The following items are to be accomplished under other divisions of
23 these specifications.

24 Temporary Heat: See Paragraph 1.7, this Section and Division 01.

25 Roof Curbs: See Paragraph 3.9, this Section.

26 Concrete: See paragraph 3.10, this Section.

27 Electrical Equipment and Wiring: See paragraph 3.11, this section.

28 Temporary Water and Toilet: See Division 01.

29 Equipment Furnished by Owner

30 The Owner may award contracts, which may commence concurrently with this contract.

31 Specifically this work will include:

32 Equipment Installation: Refer to appropriate drawings for equipment furnished by the
33 Owner and/or Specifications.
34

35 Provisions

36 Work performed under this division of the specifications shall conform to the requirements of
37 Division 1, and the mechanical drawings and all items hereinafter specified.

38 Prior to any work being performed under this division, examine architectural, structural,
39 food service, civil, electrical, specialty systems, and interior design drawings and
40 specifications. If any discrepancies occur between them and the mechanical drawings
41 and specifications, report discrepancies to the Architect in writing and obtain written
42 instructions for the work.

43 Mechanical drawings are diagrammatic, but shall be followed as closely as actual
44 construction of the building will permit. All changes from drawings necessary to make
45 the mechanical work conform to the building as constructed shall be made without
46 additional cost to the Owner.

1 Coordinate the mechanical work with the General Contractor and be responsible to him
2 for satisfactory progress of the work. Coordinate mechanical work with all other trades
3 on the project without additional cost to the Owner.

4 All work and materials covered by drawings and specifications shall be subject to review
5 at any time by representatives of the Architect and Owner. If the Architect or Owner's
6 agent finds any materials or installation that does not conform to these drawings and
7 specifications, Contractor shall remove the material from the premises and correct the
8 installation to the satisfaction of the agent.

9 In acceptance or rejection of installed mechanical systems, no allowance will be made
10 for lack of skill on the part of the installers.

11 12 Examination Of Premises/Site

13 Visit the premises site before submitting bid as no extras will be allowed for lack of knowledge
14 of existing conditions.

15 16 Codes And Standards

17 Conform to applicable sections of NFPA 13 and 24.

18 Conform to the National Electrical Code, 1999 Edition.

19 Conform to New Mexico Department of Health "Rules and Regulations Governing Schools in the
20 State of New Mexico".

21 Conform to all applicable State and Local Codes.

22 In case of difference between these specifications, codes, laws, industry standards, and/or utility
23 company regulations the most stringent shall govern.

24 Americans with Disabilities Acts (ADA) and American National Standards Institute (ANSI) 117.

25 26 Permits, Fees And Notices

27 Apply for and pay for all permits, fees, licenses and inspections for this Division of work.

28 Do not include the cost of any "Plant Investment Fee" or "System Development Charge"
29 for sewer and/or water charged by the City. This will be arranged for and paid for by the
30 Owner.

31 Do not include the cost of any "Gas Application Fee" charged by the Utility Company.
32 This will be arranged and paid for by the Owner.

33 Notify proper authorities when work is ready for inspections required by applicable codes, rules
34 and regulations, allowing sufficient time for inspections to be made without hindering progress
35 of the work. Furnish to the Owner copies of inspection certificates of acceptance.

36 37 Temporary Heat

38 Temporary heat will be furnished by the General Contractor. Use of the permanent heating
39 system will not be allowed without written authorization from the MECHANICAL ENGINEER. In
40 case the permanent heating system is used for temporary heat, the General Contractor shall pay
41 all costs until acceptance by the Owner.

42 43 Existing Utilities

44 The plans indicate the location, type and sizes of various utilities within the site where known.

45 These utilities are indicated as accurately as possible. If utilities are encountered during
46 construction, which are not shown on the drawings, ask for instructions from the Architect. Any
47 relocation or remodeling required will then be directed by change order. Assume all

1 responsibility for protection of all utilities, shown or not, and repair any damage caused by this
2 construction at no extra charge to the Owner.

3 Investigate with proper authorities for all existing water taps, etc. and make arrangements to
4 pay for all removal charges in original bid.

5 CSU as Owner of all underground utilities shall be notified at least 2 business days prior to
6 excavation so that they can locate and mark underground facilities.

7 8 Drawings

9 Mechanical drawings are diagrammatic and are not to be scaled for dimensions. Take all
10 dimensions from Architectural drawings, certified equipment drawings, and from the structure
11 itself before fabricating any work. Verify all space requirements, coordinating with other trades,
12 and install the systems in the space provided without extra charges to the Owner.

13 Conceal all piping in finished areas of the building except where otherwise noted on the
14 drawings.

15 Install all equipment in accordance with manufacturer's recommendations, unless approval is
16 given in writing by the MECHANICAL ENGINEER for deviation.

17 18 Examination Of Bidding Documents

19 Each bidder shall examine the bidding documents carefully, and not later than seven days prior
20 to the date of receipt of bids, shall make written request to the Architect for interpretation or
21 correction of any discrepancies, ambiguity, inconsistency, or error therein which he may
22 discover. Any interpretation or correction will be issued as an addendum by the Architect. Only
23 a written interpretation or correction by addendum shall be binding. No bidder shall rely upon
24 interpretations or corrections given by any other method. If discrepancies, ambiguity,
25 inconsistency, or error are not covered by addendum or written directive, Contractor shall
26 include in his bid, labor materials and methods of construction resulting in higher cost. After
27 award of contract, no allowance or extra compensation will be made on behalf of the Contractor
28 due to his failure to make the written requests as described above.

29 The person submitting the request will be responsible for its prompt delivery. Failure to so
30 request clarification of any inadequacy, omission, or conflict will not relieve the Contractor of
31 responsibility. The signing of the Contract will be considered as implicitly denoting that the
32 Contractor has a thorough comprehension of full intent and scope of the working drawings and
33 specifications.

34 35 Rough-In

36 Verify final locations for rough-ins with field measurements and with the requirements of the
37 actual equipment.

38 Refer to equipment specifications in Divisions 01 through 22 and 24 thru 33 for additional
39 rough-in requirements.

40 41 Coordination Drawings

42 Prepare and submit a set of ~~three~~ two dimensional coordination drawings showing major
43 elements, components, and systems of mechanical equipment and materials in relationship with
44 other building components. Prepare drawings to an accurate scale of $\frac{1}{4}''=1''-0''$ or larger.

45 Indicate the locations of all equipment and materials, including clearances for servicing and
46 maintaining equipment. Indicate movement and positioning of large equipment into the
47 building during construction.

1 Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively
 2 coordinate where space is limited, and where sequencing and coordination of installations are
 3 of importance to the efficient flow of the Work layouts should include (but not necessary
 4 limited) to the following:

- 5 Ductwork
- 6 Hydronic Piping
- 7 Plumbing Piping
- 8 Fire sprinkler piping
- 9 Electrical conduit mains

10

11 Mechanical Installations

12 Coordinate mechanical equipment and materials installation with other building components.
 13 Verify all dimensions by field measurements.

14 Arrange for chases, slots, and openings in other building components to allow for mechanical
 15 installations.

16 Coordinate the installation of required supporting devices and sleeves to be set in poured in
 17 place concrete and other structural components, as they are constructed.

18 Sequence, coordinate, and integrate installations of mechanical materials and equipment for
 19 efficient flow of the Work. Give particular attention to large equipment requiring positioning
 20 prior to closing-in the building.

21 Coordinate the cutting and patching of building components to accommodate the installation of
 22 the work.

23 Where mounting heights are not detailed or dimensioned, install mechanical services and
 24 overhead equipment to provide the maximum headroom possible, and in accordance with
 25 minimum required clearances as specified in codes and regulations.

26 The word "concealed" as used in this specification refers to such spaces as pipe and duct chases,
 27 pipe and duct trenches, above plastered ceilings, in walls and buried where pipe and/or duct is
 28 inaccessible when building is complete. "Exposed" is intended to be within equipment rooms,
 29 unfinished areas, above "push up" ceilings, accessible pipe and duct tunnels.

30 The term "furnish" means supply and deliver to Project, unless otherwise defined in greater
 31 detail. The term "install" is used to describe operations at Project, from inspecting and
 32 unloading, to completion in place, ready for intended use. The term "provide" means furnish
 33 and install, complete and ready for intended use, unless otherwise defined in greater detail.

34

35 Submittals

36 Submit under provisions of Division 01.

37 Proposed Product List: Include Products specified in Division 23 specifications.

38 Submit shop drawings and product data grouped to include complete submittals of related
 39 systems, Products, and accessories in a single submittal.

40 Mark dimensions and values in units to match those specified.

41 Submit miscellaneous items specified on the drawings, but not covered in the specifications.

42 Make no substitutions without prior approval from the Architect.

43

44 Shop Drawings

45 Submit shop drawings on all equipment, Temperature Controls and Fire Protection. Provide
 46 shop drawings to the Architect and Engineer showing locations of all access panels.

47 Shop drawings required for section 23 work included (but not necessary limited to) the
 48 following:

1	Insulation
2	Boiler
3	Chillers
4	Pumps
5	Cooling Towers
6	Storage tanks
7	Exhaust Fans
8	Heat Exchangers
9	Rooftop Air Handlers
10	Cabinet Heaters
11	Water Treatment
12	Indoor Air handlers
13	Valves, Meter, Gages
14	Expansion Fittings
15	Piping
16	Motor Starters
17	Temperature controls
18	Hangers and Supports
19	Grilles, Registers, Diffusers, Louvers
20	Fan Coil Units

21 Present shop drawing submittal data at one time, bound in three-ring binders, indexed in a neat
 22 and orderly manner. Partial submittals will not be accepted. Provide five sets of submittal data,
 23 unless noted otherwise in Division 01. Do not begin work until one (1) copy is returned.
 24 Provide, with shop drawing submittal, 1/4" scale layout drawings of equipment rooms. Layouts
 25 shall show locations of equipment, piping, clearance etc. and shall be coordinated with electrical
 26 equipment, and equipment shall be drawn to scale.
 27 Place orders for all equipment in time to prevent any delay in construction schedule or
 28 completion of project. If any materials or equipment are not ordered in time, additional charges
 29 made by equipment manufacturers to complete their equipment in time to meet construction
 30 schedule, together with any special handling charges, shall be borne by the Contractor.
 31 Contractor agrees that shop drawing submittals processed by the engineer are not change
 32 orders. The purpose of shop drawing submittals by the Contractor is to demonstrate to the
 33 engineer that the Contractor understands the design concept, that he demonstrates his
 34 understanding by indicating which equipment and material he intends to furnish and install and
 35 by detailing the fabrication and installation methods he intends to use. Contractor further
 36 agrees that if deviations, discrepancies, or conflicts between shop drawing submittals and
 37 contract documents in the form of design drawings and specifications are discovered either
 38 prior to or after shop drawings and specifications shall control and shall be followed.
 39 Contractor to provide manufacturers' recommended installation manuals for equipment.
 40 Review of shop drawings does not relieve this Contractor from the responsibility of furnishing
 41 equipment and materials of proper dimension, size, quantity, quality and all performance
 42 characteristics to efficiently perform the requirements and intent of the contract documents.
 43 Review does not relieve this Contractor from responsibility for errors on the shop drawings. If
 44 the shop drawings deviate from the contract documents, advise the MECHANICAL ENGINEER of
 45 the deviations in writing accompanying the shop drawings, including the reasons for the
 46 deviations. Coordinate all required changes with the other trades affected. If the changes are
 47 occasioned by the Contractor, he shall pay any costs involved.

Project/Site Conditions

Install Work in locations shown on Drawings, unless prevented by Project conditions. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other sections. Obtain permission of Architect before proceeding.

Project Record Drawings

During the process of the work, maintain an accurate record of the installation of the mechanical systems. Upon completion of the mechanical systems installation, transfer all record data to blue-line prints of the original drawings. Drawings shall include all addendum items, charge orders, alternations, reroutings, etc. As a condition of acceptance of the project, deliver to the Architect one copy of the record drawings.

Warranty

All materials and equipment shall be new unless otherwise specified. Guarantee all workmanship, materials and equipment and replace any found defective without cost to the Owner, for one year after final acceptance, as defined in General Conditions. Each warranty for longer than the one year described above (that comes with equipment used on the job) shall be passed on to the owner with dates of start and end of the warranty.

Engineering By Contractor

The construction of this building requires the contractor to design several systems or subsystems. All such design shall be the completed responsibility of the contractor. Systems or subsystems which require engineering responsibility by the contractor include, but are not limited to:

- Equipment supports, not fully detailed in the drawings.
- Pipe hangers and anchors not specified in these documents, or catalogued by the manufacturer.
- ~~Temperature controls.~~
- Water treatment.
- Seismic restraints.

PRODUCTSEquipment Manufacturer

Equipment in the following categories shall be of one manufacturer or available through one manufacturer for each category to facilitate ease of maintenance for the Owner.

- Motors (open drip-proof squirrel cage)
- Starters
- Booster Pumps
- Single Suction Pumps
- Double Suction Pumps
- Temperature Controls
- Plumbing Fixture Trim
- Thermometers
- Pressure Gauges
- Gate Valves
- Butterfly Valves

- 1 Plug Valves
- 2 Globe Valves
- 3 Check Valves
- 4 Balancing Valves
- 5 Radiator Valves
- 6 Traps
- 7 Dielectric Unions
- 8 Strainers
- 9 Air Filters

10

11 SUBSTITUTIONS (PRIOR APPROVALS, During The Bid Phase)

12 Bidder's Choice

13 Materials, equipment or services listed by several identifying names are intended to be
 14 bidder's choice, and any of the listed names may be bid without soliciting prior
 15 acceptance. Where more than one name is given in the specifications, the
 16 manufacturer's material, equipment or services scheduled on the drawings is
 17 contemplated and any changes and their costs, required to accommodate the other
 18 named material or equipment as well as space requirements for the other named
 19 materials or equipment, must be assumed by the Contractor in his bid. (See Shop
 20 Drawing Requirement).

21 Performance Specification

22 When any product is specified only by requirement to meet an industry standard or
 23 regulating body standard (such as U.L., AGA, AWWA, ANSI, etc.) and the item proposed
 24 carries approval of that body, no prior acceptance by the MECHANICAL ENGINEER is
 25 needed.

26 When any product or service is specified by requirement to meet a performance
 27 standard or is specified by a generic specification, (no manufacturers name listed) no
 28 prior acceptance by the MECHANICAL ENGINEER is needed except as specifically called
 29 for in these specifications.

30 Acceptance

31 Material and equipment specified is used as a basis of standard, and while not
 32 specifically mentioned, material gauges, weights, appearance and space requirements
 33 must be met by any substitutions.

34 Action for substitutions specified herein will be given only after the receipt of complete
 35 data showing performance over entire range, physical dimensions and material
 36 construction all SPECIFICALLY marked for the individual item. Letter of transmittal with
 37 at least one (1) copy and one (1) marked up copy of all descriptive data shall be
 38 submitted to the MECHANICAL ENGINEER'S Office.

39 Submit shop drawings for all materials and equipment other than the first named in
 40 these specifications showing any changes required in piping, ducting, electrical wiring,
 41 space allocation etc. Be responsible to make all changes required to accommodate and
 42 to pay for these changes. Coordinate changes required with all other trades. Pay for all
 43 changes resulting from re-arranging equipment.

44 See General Conditions for method of notification of acceptance.

1
2 Substitutions (Contractor And/Or Owner Initiated)

3 Materials or equipment listed by several manufacturers' names are intended to be bidder's
4 choice, and any of the listed manufacturers may be used in the base bid. Materials or
5 equipment not listed are considered substitutions.

6 Performance Specification: When any item is specified by requirement to meet a performance,
7 industry or regulating body standard or is specified by a generic spec, (no manufacturer's name
8 listed) no prior approval by the Consulting Mechanical Engineer is needed unless specifically
9 called for in these specifications.

10 Contractor to be responsible for any changes and costs, including design costs, to accommodate
11 any equipment except the first named in the specification.

12 Substitutions for Material

13 Systems, equipment, and materials not listed as equivalents may be proposed as
14 deductive alternates to specified items by submitting them as a separate line item to the
15 base bid on the Bidder's letterhead.

16 Such deductive alternate proposals shall not be substituted for the base bid systems,
17 equipment, and materials. Deductive alternate proposals must be accompanied by full
18 descriptive data on the proposed equipment with a statement of the cost to be
19 deducted for each item and all deviations from specified items. Highlight all difference
20 from specified equipment. If the Owner elects to consider such deductive alternates,
21 the Contractor shall submit a list of the proposed deductive alternate substitution items
22 within 14 days of award of contract. Late requests for proposed substitutions due to
23 scheduling or delivery concerns will not be accepted by the Engineer.

24
25 Bid Alternate(S)

26 Refer to Division 01 and all contract documents for additional information.

27 Alternate(s) for Material and Equipment

28 Equipment and material bid alternate(s) shall be proposed as additive or deductive
29 alternate(s) to specified items by submitting it as a separate line item from the base bid
30 on the Bidder's letterhead.

31 Such bid alternate proposals shall not be substituted or included in the base bid. Bid
32 alternate proposal(s) must be accompanied by full descriptive data on the proposed
33 equipment, together with a statement of the cost to be added or deducted for each
34 item. The bid alternate shall include all materials, equipment, labor, electrical
35 connections, coordination with all other trades, etc. for a complete and operational
36 system.

37 The Contractor shall submit the bid alternates at the time the base bids are due.
38

39 Safety Provisions

40 Any refrigeration system containing CFC-11, CFC-12, HCFC-123, HCFC-22, or any of the other
41 refrigerants listed in the Clean Air Act as a Class I or Class II Ozone Depleting Compound shall
42 comply with the Clean Air Acts.

43 As a minimum all systems shall be equipped with refrigerant recovery service valves, relief
44 valves capable of resetting after activation, and for system with more than 50 pounds of charge,
45 and isolateable receiver and/or condenser capable of holding the complete charge.
46

47 Heat Trace

48 Manufacturers:

1 Raychem Model: XL-Trace for freeze protection applied between pipe and insulation.

2 Other acceptable manufacturers:

3 Thermon.

4 Hevi-Duty/Nelson.

5 Features:

6 Self regulating at all points along its length.

7 90% power reduction from 40°F pipe temperature to 150°F pipe temperature.

8 No overheating if crossed.

9 Provide outer jacket and braided copper shield for use inside roof drain leaders or on
10 piping without a ground path.

11 Accessories:

12 Provide tee, splice, and end seal kits as required by the manufacturer.

13 Provide ambient sensing thermostat in a NEMA 4x enclosure with three (3) contacts
14 rated at 22 amps each.

15 EXECUTION

16
17 Storage

18 Provide for proper storage of all materials and equipment and assume responsibility for losses
19 due to any cause. All storage shall be within the contact limit lines of the building site. Cover
20 and store all equipment and materials out of elements; any rusted or weather damaged item
21 shall not be used.

22
23 Product Installation

24 Manufacturer's Instructions

25 Except where more stringent requirements are indicated, comply with the product
26 manufacturer's instructions and recommendations.

27 Consult with manufacturer's technical representatives, who are recognized as technical
28 experts, for specific instructions on special project conditions.

29 If a conflict exists, notify the Architect/Engineer in writing and obtain his instruction
30 before proceeding with the work in question.

31 Movement of Equipment

32 Wherever possible, arrange for the movement and positioning of equipment so that
33 enclosing partitions, walls and roofs will not be delayed or need to be removed.

34 Otherwise, advise Contractor of opening requirements to be maintained for the
35 subsequent entry of equipment.

36 Return Air Path: Coordinate mechanical work in return air plenum to avoid obstructing return air
37 path.

38 Do not make changes in layout which will reduce return air path cross-sectional areas.

39 Minimum cross-sectional area will provide a maximum of 500 fpm velocity through
40 return air plenum at specified supply air quantity unless otherwise noted.

41 Report any obstructions by work of other Divisions to Architect/Engineer.

42 Clearances

43 Install piping and ductwork:

44 Straight and true.

45 Aligned with other work.

46 Close to walls and overhead structure (allowing for insulation).

47 Concealed, where possible, in occupied spaces.

48 Out-of-the-way with maximum passageway and headroom remaining in each space.

1 Except as otherwise indicated, arrange mechanical services and overhead equipment
2 with a minimum of:

3 7'0" headroom in storage spaces.

4 8'6" headroom in other spaces.

5 Do not obstruct windows, doors or other openings.

6 Give the right-of way to piping systems required to slope for drainage (over other
7 service lines and ductwork).

8 Offsets, transitions and changes in direction in pipes and ducts shall be made as
9 required to maintain proper head room and pitch of sloping pipes whether or not
10 indicated on the drawings. Furnish and install all traps, air vents, sanitary vents, etc., as
11 required to affect these offsets, transitions and changes in direction.

12 Access

13 Install all work to permit removal (without damage to other parts) of coils, heat
14 exchanger bundles, boiler tubes, fan shafts and wheels, filters, belt guards, sheaves and
15 drives, and all other parts which might require periodic replacement or maintenance.

16 Arrange pipes, ducts, and equipment to permit ready access to valves, traps, starters,
17 motors, control components and to clear the openings of doors and of access panels.

18 Protection Of Work And Property

19 Where there are existing facilities, be responsible for the protection thereof, whether or not
20 such facility is to be removed or relocated. Moving or removing any facility must be done so as
21 not to cause interruption of the work of Owner's operation.

22 Close all pipe and duct openings with caps or plugs during installation. Cover all fixtures and
23 equipment and protect against injury. At the final completion, clean all work and deliver in an
24 unblemished condition, or refinish and repaint at the discretion of the Architect.

25 Do not allow any fans in the HVAC system to operate before the area served by the fan has been
26 cleaned and vacuumed of all debris and dust which might enter the system.

27 Any equipment, duct or piping systems found to have been damaged or contaminated above
28 "MILL" or "SHOP" conditions shall be replaced or cleaned to the Engineer's satisfaction.

29 Initial fill of traps

30 Provide initial water seal fill for all waste p-traps, condensate traps, or similar traps.

31 Protection Of Potable Water Systems

32 All temporary water connections shall be made with an approved back flow preventer.

33 All hose bibbs shall have, as a minimum, a vacuum breaker to prevent back flow.

34 Direct connections to hydronic systems shall only be made through a reduced pressure back
35 flow preventer.

36 Protection Of Systems Serving Occupied Spaces

37 Where work is being performed in occupied spaces, or occupancy is to be phased in with
38 ongoing construction contractor shall prevent contamination of all systems serving the
39 occupants including but not limited to:

40 Supply or return air

41 Systems shall be capped or provided with adequate particulate and gas phase filtration
42 to prevent dust, chemical, or biological contamination. Particulate filters shall be as a
43 minimum equivalent to those specified for the completed system.

1 Refrigeration Systems

2 All technicians involved in the installation of refrigeration systems shall be certified and trained
 3 in accordance with the applicable sections of the Clean Air Act.
 4 No refrigerant shall be intentionally vented to the atmosphere. All refrigerant shall be
 5 recovered before opening a closed system for charging, evacuation, service, or installation.
 6

7 Demonstration

8 Refer to Division 1 sections of the specifications regarding requirements of Record Drawings and
 9 Operation and maintenance Manual submittal and systems demonstration.
 10 Demonstrate that each system operates properly.
 11 Explain the operation of each system to the Owner’s Representative. Explain use of
 12 O&M manual in operating and maintaining systems.
 13 Date and time of demonstration will be determined by the Owner.
 14

15 Roof Curbs

16 Roof curbs and roof flashings for all equipment located on the roof shall be furnished under the
 17 Architectural Division (except for any sound, return or specialty curbs or roof top units' integral
 18 curbs specified herein). Furnish and install all counter flashing of the same material as the
 19 flashing.
 20

21 Concrete

22 All poured in place concrete shall be furnished under the Architectural Divisions of these
 23 Specifications.
 24 This Contractor shall coordinate all requirements for concrete surrounding buried duct. Ducts
 25 shall be tied down to concrete deadman and completely surrounded with 3" of concrete.
 26

27 Electrical Equipment And Wiring For Mechanical Division

28 Unless otherwise indicated, all motors and controls shall be furnished, set in place and wired in
 29 accordance with the following schedule. (MD is Mechanical Division - ED is Electrical Division).
 30

ITEM	FURNISHED UNDER	SET IN PLACE OR MOUNTED UNDER	WIRED AND CONNECTED UNDER
Equipment Motors and Thermal overloads, resistance heaters (c).	MD	MD	ED
Motor Controllers; magnetic starters, reduced voltage starters and overload relays.	ED	ED(a)	ED
Disconnect switches, fused or unfused, H.P. rated switches, thermal overload switches and fuses,	ED(a)	ED(a)	ED

manual operating switches.			
Push-button stations, pilot lights, multi-speed switches, float switches, thermostats, control relays, time clocks, control transformers, control panels, motor valves, damper motors, solenoid valves, EP and PE switches and interlocks.	MD	MD(b)	MD(b)
Contactors, 120V control circuit outlets for control panels and for boiler controls and for fire protection controls and smoke detectors.	MD	ED	ED
Duct Detectors, fire/smoke dampers, elevator vent dampers.	MD	MD	ED(c)

a) If furnished as part of factory wired equipment, wiring and connections only by ED.

b) If float switches, line thermostats, P.E. switches, time switches, etc., carry the FULL LOAD CURRENT to any motor, they shall be furnished by the Mechanical Division, but shall be set in place and connected under the Electrical Division, except that where such items are no integral part of the mechanical equipment, or directly attached to ducts, piping, etc., they shall be set in place under the Mechanical Division and connected by the Electrical Division. If they do not carry the FULL LOAD CURRENT to any motor they shall be furnished, set in place and wired under the Mechanical Division. Control devices carrying full load current furnished by Mechanical and wired by Electrical shall be located at the device being controlled, unless shown on drawings or mutual agreement is made between the contractors with no change in the contract price.

Wiring from alarm contacts to alarm system by ED; all control function wiring by MD.

The above list does not attempt to include all components. All items necessary for a complete system shall be included in the base contract.

Connections to all controls directly attached to ducts, piping and mechanical equipment shall be made with flexible connectors.

Identification

Piping

1 All exposed piping, except piping in finished spaces, shall be identified in conformance
 2 with "Scheme for the Identification of Piping Systems", ANSI A13. All markers must be
 3 in compliance with respect to (1) proper letter color, (2) proper letter size, (3) correct
 4 background color, and (4) proper marker length.

5 Directional flow arrows shall be applied adjacent to each pipe mark.

6 For pipes under 3/4" O.D. color coded (as described above) identification tags shall be
 7 securely fastened at all required locations. Tags shall be 1-1/2 inches in diameter.

8 All piping shall be marked at the following locations: (1) next to each valve and fitting,
 9 (2) at each branch and riser take-off, (3) at each wall, ceiling or floor penetration, (4) on
 10 pipes that lead to and from underground areas, and (5) every 30 feet on horizontal and
 11 vertical pipe runs. Identification of all piping systems shall conform to the designations
 12 in the mechanical legend on the drawings.

13 Valves

14 All valves shall be identified by color coded (to match piping system identification) tags
 15 which indicate both service and number. Tags shall be 1-1/2 inch in diameter and have
 16 1/4 inch high letters to indicate service and 7/16 inch high numbers. Tags shall be
 17 securely fastened to all valves. Service designations shall match abbreviations for piping
 18 systems given in mechanical legend on the drawings. Valve charts shall be provided and
 19 shall include (1) valve identification number, (2) service, (3) location, and (4) purpose.

20 Valve charts shall be mounted in metal frame with glass enclosure. One valve chart shall
 21 be secured on a wall in the boiler room. A second valve chart shall be delivered to the
 22 Owner's authorized representative. Also a copy of the valve chart shall be included in
 23 the Operations and Maintenance Instructions.

24 All fire dampers and their access doors shall be identified by printed stencil secured to the
 25 access door or a location approved by the Architect.

26 All pneumatic and electric controls, starters, air handling units, pumps, and all other equipment
 27 and controls shall be identified by stencil or permanent labeling.

28 Care shall be taken not to paint over nameplates.

29 Flushing, Cleaning & Sterilizing

30 Intent: It is the intent of this specification to require that all work, including the inside of
 31 equipment, be left in a clean condition with all dust, grease, and construction debris removed.

32 Piping and connection equipment to be left free of sediments, core sand, grease, etc.

33 Clean all exposed surfaces of piping, ducts and hangers, etc., sufficiently to receive
 34 paint. Vacuum ducts as required for debris removal.

35 Air systems shall not be operated without filters. Replace the filters or clean permanent
 36 type filters just prior to substantial completion. All air systems shall be furnished with
 37 one additional set of filters for owner replacement.

38 Remove and clean all screens, interceptors, strainers, etc., in piping systems just prior to
 39 substantial completion.

40 Clean and wipe dry all exposed valves, faucets, and piping, etc. that are exposed just
 41 prior to substantial completion. Clean all equipment and fixtures per manufacturer's
 42 specifications to avoid scratching finished surfaces.

43 Clean interior and exterior of all air handling equipment of all construction debris. Clean
 44 exterior of all exposed ductwork just prior to substantial completion.

45 Thoroughly clean all equipment room floors after completion of equipment, pipe and
 46 duct cleaning. A condition of final acceptance will be the cleanliness of all exposed
 47 systems, equipment, and equipment rooms.
 48

1 Before final connections are made in the piping systems, blow out all piping with air and then
 2 wash out with cleaning compounds. Then flush the system to remove of all foreign materials.
 3 Furnish all temporary connections, valves, etc, required for this purpose. Clean the boiler and
 4 chiller by the same procedure.

5 After flushing, sterilize the domestic water system in accordance with Section 221116.

7 Testing

8 Test all low pressure steam, condensate, heating water, snowmelt, reduced pressure domestic
 9 water piping, condenser water, and chilled water piping at 150 psig hydrostatic pressure before
 10 connecting to unit.

11 Test all high pressure steam and condensate, domestic water service lines to PRV, fire lines,
 12 radiant panel (embedded in concrete) and anti-freeze piping at 200 psig hydro static pressure.

13 Test all air, oil and gas piping under 60 psig air pressure.

14 Test all refrigeration piping under 150 psig pressure using oil pumped, dry nitrogen and tapping
 15 of joints if there is any loss of pressure, soap each joint to find leaks. Charge with 10 psig
 16 refrigerant and test with halide torch or electronic leak detector. Evacuate using vacuum pump
 17 to 500 microns and purge twice with oil pumped, dry nitrogen.

18 Test all high velocity ductwork from supply fan to boxes before ducts are concealed and before
 19 boxes are connected. All openings shall be capped off and partial sections of the duct to be
 20 tested using a fan capable of building 8" S.P. Use U-gauge manometer to test S.P. Repair all
 21 audible and visible leaks using smoke in ducts.

22 All tests must be done to the satisfaction of the local authorities having jurisdiction, before
 23 covering.

24 All hydrostatic tests to be held for a minimum of six hours without loss of pressure. Air tests to
 25 be held for a minimum of two hours without loss of pressure.

26 Furnish all instruments required for testing.

28 Placing In Operation

29 Clean all ducts, pipes, equipment, controls etc., of plaster and other foreign debris.

30 Before final acceptance, clean or replace all strainers, oil or grease all bearings and clean out all
 31 drains. Clean and recoat all permanent filters, replace throwaway type filters with new filters.

32 The systems shall be put into operation.

33 The Contractor shall verify that all controls are set to meet operating conditions
 34 specified.

35 Example: Boiler operating and limit controls set where specified.

36 The contractor shall verify that all pieces of equipment are operable and that all
 37 sequences of control are being met.

38 The contractor to adjust settings through 1st year as required by MECHANICAL
 39 ENGINEER.

41 Balancing

42 The balancing of the system refer to Division 23 Testing Adjusting and Balancing

44 Operation And Maintenance Instructions

45 Books of Operating and Maintenance Instructions shall be personally delivered to the Owner's
 46 authorized representative and the Owner instructed as to their use and the equipment involved.
 47 (Provide two books for each building). Also, instruct the Owner's personnel on each valve and
 48 the valve chart previously specified.

The book shall contain, but not be limited to, the following general items:

- Spare parts lists for each piece of equipment.
- Operating manuals for each piece of equipment and control.
- Lubrication charts showing type of lubricant and application methods and frequencies.
- Filter cleaning or replacement schedule. (On Contractor's letterhead stationary).
- Preventive maintenance schedule for checking all items such as belt drive, safety controls and oil and refrigerant charges. Cleaning schedule of all strainers, traps, coils, tubes, tower pans, sprays, etc. (On Contractor's letterhead stationary).
- Water treatment recommendations for boiler, tower, etc.
- Normal operating instructions including a sequence of operation for each system. (On Contractor's letterhead stationary).
- Instructions as to procedure to be followed for any emergency situation, such as alarms or safety items being tripped. (On Contractor's letterhead stationary).
- Instructions on who to call for service during guarantee period. (On Contractor's letterhead stationary).
- Record of equipment installed (copy of each shop drawing as set forth under "Shop Drawing" Paragraph).
- All warranties provided by Manufacturers on their equipment that run longer than the one year guarantee by the Contractor.

Books shall be arranged in sequence to match the equipment schedules included in the specifications.

Approval will not be given for final payment until the tests, balancing and operating instruction portions have been completed.

Equipment Start-Up

All refrigeration and packaged equipment shall be started by the manufacturer or under the manufacturer's supervision. Start-up data shall be recorded in logs. Copies of start-up logs shall be forwarded to Mechanical Engineer and included in Operation and Maintenance manuals.

Construction Waste Management: Construction Waste shall be managed in accordance with provisions of Section 01 74 19 Construction Waste Management and disposal. Documentation shall be submitted to satisfy the requirements of that section.

Heat Trace

Heat trace cable shall be installed by a licensed electrician.

Apply the heat trace cable on the pipe after pressure testing.

- Do not spiral wrap on pipe.
- Make one wrap at valves.
- Secure to pipe with methods approved by manufacturer.

Apply "Electrically Traced" signs on resistance 20 mega ohms.

Test with a 1000 VDC megger minimum resistance 20 mega ohms.

Heat trace shall be sized as follows, based on -20°F ambient, to maintain 40°F pipe temperature:

PIPE SIZE	1" INSULATION	2" INSULATION
Less than 2"	3 w/ft	3 w/ft
2", 2-1/2", 3"	5 w/ft	3 w/ft
4", 5", 6"	8 w/ft	5 w/ft
8", 10", 12 "	8 w/ft ea. (2 cable circuits)	8 w/ft

1910

1 END OF SECTION

1 SECTION 23 0516 - EXPANSION FITTINGS & LOOPS FOR HVAC PIPING

2
3 GENERAL

4
5 Summary

6 This Section includes the following pipe expansion joints and expansion compensation devices
7 for mechanical piping systems:

- 8 Metal-bellows expansion joints.
- 9 Flexible hose expansion loops with metal ends.
- 10 Pipe bends and loops.
- 11 Alignment guides and anchors.

12
13 Submittals

14 Product Data: For each type of pipe expansion joint and alignment guide indicated.
15 Operation and Maintenance Data: For pipe expansion joints to include in emergency, operation,
16 and maintenance manuals.

17
18 PRODUCTS

19
20 Manufacturers

21 In other Part 2 articles where titles below introduce lists, the following requirements apply to
22 product selection:

23 Manufacturers: Subject to compliance with requirements, provide products by one of
24 the manufacturers specified.

25
26 Expansion Joints

27 Flexible Hose expansion loops.

28 Manufacturers:
29 Metraflex, Inc.

30
31 Flexible hose expansion loops shall be manufactured with two parallel sections of
32 corrugated metal hose with two parallel sections of corrugated metal hose, compatible
33 braid, 180 degree return bend with inlet and outlet connections.

34
35 Flexible hose expansion loops shall impart no thrust loads to the support system,
36 anchors or building structure.

37
38 Operating pressure shall be 212 psi minimum at 70 degrees.

39
40 End connection material shall be consistent with pipe material.

41
42 Metal-Bellows Expansion Joints: ASTM F 1120, circular-corrugated-bellows type with external
43 tie rods.

44 Manufacturers:
45 Metraflex, Inc.
46 Unaflex Inc.

1 Metal-Bellows Expansion Joints for Copper Piping: Single- or multiple-ply phosphor-
 2 bronze bellows, copper pipe end connections, and brass shrouds.
 3 Metal-Bellows Expansion Joints for Steel Piping: Single- or multiple-ply stainless-steel
 4 bellows, steel pipe end connections, and carbon-steel shroud.
 5 Minimum Pressure Rating: 175 psig, unless otherwise indicated.
 6 Configuration: Single- or double-bellows type with base, unless otherwise indicated.
 7 End Connections: Flanged.

8 9 10 Alignment Guides

11 Description: Steel, factory fabricated, with bolted two-section outer cylinder and base for
 12 alignment of piping and two-section guiding spider for bolting to pipe.

13 Manufacturers:

14 Adsc0 Manufacturing, LLC.
 15 Advanced Thermal Systems, Inc.
 16 Flex-Hose Co., Inc.
 17 Flexicraft Industries.
 18 Flex-Weld, Inc.
 19 Hyspan Precision Products, Inc.
 20 Metraflex, Inc.
 21 Piping Technology & Products, Inc.
 22 Senior Flexonics, Inc.; Pathway Division.

23 24 Materials For Anchors

25 Steel Shapes and Plates: ASTM A 36/A 36M.
 26 Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex head.
 27 Washers: ASTM F 844, steel, plain, flat washers.
 28 Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened
 29 portland cement concrete, and tension and shear capacities appropriate for application.
 30 Stud: Threaded, zinc-coated carbon steel.
 31 Expansion Plug: Zinc-coated steel.
 32 Washer and Nut: Zinc-coated steel.
 33 Chemical Fasteners: Insert-type-stud bonding system anchor for use with hardened portland
 34 cement concrete, and tension and shear capacities appropriate for application.
 35 Bonding Material: ASTM C 881, Type IV, Grade 3, 2-component epoxy resin suitable for
 36 surface temperature of hardened concrete where fastener is to be installed.
 37 Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless
 38 otherwise indicated.
 39 Washer and Nut: Zinc-coated steel.
 40 Concrete: Portland cement mix, 3000 psi minimum. Refer to Division 03 Section "Cast-in-Place
 41 Concrete" for formwork, reinforcement, and concrete.
 42 Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink,
 43 nonmetallic grout; suitable for interior and exterior applications.
 44 Properties: Nonstaining, noncorrosive, and nongaseous.
 45 Design Mix: 5000-psi, 28-day compressive strength.

1 EXECUTION

3 Expansion-Joint Installation

4 Install manufactured, nonmetallic expansion joints according to FSA's "Technical Handbook:
5 Non-Metallic Expansion Joints and Flexible Pipe Connectors."

6 Install expansion joints of sizes matching size of piping in which they are installed.

7 Install alignment guides to allow expansion and to avoid end-loading and torsional stress.

8 Every pipe penetrating basement and 1st floor slab shall have a minimum of 1" expansion joint
9 with anchor due to expansive soils – every pipe.

11 Pipe Bend And Loop Installation

12 Install pipe bends and loops cold-sprung in tension or compression as required to partly absorb
13 tension or compression produced during anticipated change in temperature.

14 Attach pipe bends and loops to anchors.

15 Steel Anchors: Attach by welding. Comply with ASME B31.9 and ASME Boiler and
16 Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

17 Concrete Anchors: Attach by fasteners. Follow fastener manufacturer's written
18 instructions.

20 Swing Connections

21 Connect risers and branch connections to mains with at least five pipe fittings, including tee in
22 main.

23 Connect risers and branch connections to terminal units with at least four pipe fittings, including
24 tee in riser.

25 Connect mains and branch connections to terminal units with at least four pipe fittings,
26 including tee in main.

28 Flexible Hose Expansion Loops

29 Flexible hose return fitting shall be supported to allow movement.

30 Install and guide per manufacturers' installation instructions and Mechanical Contractors
31 Association of America "Guideline for Quality Piping Installations"

33 Alignment-Guide Installation

34 Install guides on piping adjoining pipe expansion joints and bends and loops.

35 Attach guides to pipe and secure to building structure.

37 Anchor Installation

38 Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9
39 and to prevent transfer of loading and stresses to connected equipment.

40 Fabricate and install steel anchors by welding steel shapes, plates, and bars to piping and to
41 structure. Comply with ASME B31.9 and AWS D1.1.

42 Construct concrete anchors of poured-in-place concrete of dimensions indicated and include
43 embedded fasteners.

44 Install pipe anchors according to expansion-joint manufacturer's written instructions if
45 expansion joints or compensators are indicated.

46 Use grout to form flat bearing surfaces for expansion fittings, guides, and anchors installed on or
47 in concrete.

1910

1 END OF SECTION

1 SECTION 23 0519 - METERS AND GAGES

2
3 GENERAL

4
5 Summary

6 This Section includes the following meters and gages for mechanical systems:

7 Thermometers.

8 Gages.

9 Test plugs.

10 Flowmeters.

11 Thermal-energy meters.

12
13 Definitions

14 CR: Chlorosulfonated polyethylene synthetic rubber.

15 EPDM: Ethylene-propylene-diene terpolymer rubber.

16
17 Submittals

18 Product Data: For each type of product indicated; include performance curves.

19 Shop Drawings: Schedule for gages, flowmeters, and energy meters indicating manufacturer's
20 number, scale range, and location for each.

21 Operation and Maintenance Data: For flowmeters and thermal-energy meters to include in
22 emergency, operation, and maintenance manuals.

23
24 PRODUCTS

25
26 Manufacturers

27 In other Part 2 articles where titles below introduce lists, the following requirements apply to
28 product selection:

29
30 Manufacturers: Subject to compliance with requirements, provide products by one of
31 the manufacturers specified.

32
33 Direct-Mounting, Vapor-Actuated Dial Thermometers

34 Manufacturers:

35
36 Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.

37 KOBOLD Instruments, Inc.

38 Marsh Bellofram.

39 Trerice, H. O. Co.

40 Weiss Instruments, Inc.

41 Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

42 Case: Dry type, cast aluminum, 4-1/2-inch diameter.

43 Element: Bourdon tube or other type of pressure element.

44 Movement: Mechanical, connecting element and pointer.

45 Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

46 Pointer: Red metal.

47 Window: Glass or plastic.

48 Ring: Metal.

1 Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with
2 locking device.

3 Thermal System: Liquid- -filled bulb in copper-plated steel, aluminum, or brass stem for
4 thermowell installation and of length to suit installation.

5 Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5
6 percent of range.

7
8 Bimetallic-Actuated Dial Thermometers

9 Manufacturers:

10
11 Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.

12 Ernst Gage Co.

13 Eugene Ernst Products Co.

14 Marsh Bellofram.

15 Miljoco Corp.

16 NANMAC Corporation.

17 Noshok, Inc.

18 Palmer - Wahl Instruments Inc.

19 REO TEMP Instrument Corporation.

20 Tel-Tru Manufacturing Company.

21 Trerice, H. O. Co.

22 Weiss Instruments, Inc.

23 Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

24 WIKA Instrument Corporation.

25 Winters Instruments.

26 Description: Direct-mounting, bimetallic-actuated dial thermometers complying with
27 ASME B40.3.

28 Case: Liquid-filled type, stainless steel with 5-inch diameter.

29 Element: Bimetal coil.

30 Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

31 Pointer: Red metal.

32 Window: Glass or plastic.

33 Ring: Stainless steel.

34 Connector: Adjustable angle type.

35 Stem: Metal, for thermowell installation and of length to suit installation.

36 Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5
37 percent of range.

38
39 Thermowells

40 Manufacturers: Same as manufacturer of thermometer being used.

41 Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type,
42 diameter, and length required to hold thermometer.

43
44 Pressure Gages

45 Manufacturers:

46
47 Miljoco Corp.

48 Palmer - Wahl Instruments Inc.

1 Tserice, H. O. Co.
 2 Weiss Instruments, Inc.
 3 Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
 4 WIKA Instrument Corporation.

5 Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

6
 7 Case: Dry type, drawn steel or cast aluminum, 4-1/2-inch diameter.
 8 Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
 9 Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is
 10 indicated.
 11 Movement: Mechanical, with link to pressure element and connection to pointer.
 12 Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
 13 Pointer: Red metal.
 14 Window: Glass or plastic.
 15 Ring: Brass.
 16 Accuracy: Grade A, plus or minus 1 percent of middle half scale.
 17 Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
 18 Range for Fluids under Pressure: Two times operating pressure.

19 Remote-Mounting, Dial-Type Pressure Gages: ASME B40.100, indicating-dial type.

20
 21 Case: Dry type, drawn steel or cast aluminum, 4-1/2-inch (diameter with holes for panel
 22 mounting).
 23 Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
 24 Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is
 25 indicated.
 26 Movement: Mechanical, with link to pressure element and connection to pointer.
 27 Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
 28 Pointer: Red metal.
 29 Window: Glass.
 30 Ring: Brass.
 31 Accuracy: Grade A, plus or minus 1 percent of middle half scale.
 32 Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
 33 Range for Fluids under Pressure: Two times operating pressure.

34 Pressure-Gage Fittings:

35
 36 Valves: NPS 1/4 brass or stainless-steel needle type.
 37 Syphons: NPS 1/4 coil of brass tubing with threaded ends.
 38 Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal
 39 disc of material suitable for system fluid and working pressure.

41 Test Plugs

42 Manufacturers:

43
 44 Flow Design, Inc.
 45 MG Piping Products Co.
 46 National Meter, Inc.
 47 Peterson Equipment Co., Inc.
 48 Sisco Manufacturing Co.

1 Trerice, H. O. Co.

2 Watts Industries, Inc.; Water Products Div.

3 Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and
4 threaded cap, with extended stem for units to be installed in insulated piping.

5 Minimum Pressure and Temperature Rating: 500 psig at 200 deg F .

6 Core Inserts: One or two self-sealing rubber valves.

7
8 Insert material for air, water, oil, or gas service at 20 to 200 deg F shall be CR.

9 Insert material for air or water service at minus 30 to plus 275 deg F shall be EPDM.

10 Test Kit: Furnish one test kit containing one pressure gage and adaptor, one thermometer, and
11 carrying case. Pressure gage, adapter probes, and thermometer sensing elements shall be of
12 diameter to fit test plugs and of length to project into piping.

13
14 Pressure Gage: Small bourdon-tube insertion type with 2- to 3-inch-diameter dial and
15 probe. Dial range shall be 0 to 200 psig .

16 High-Range Thermometer: Small bimetallic insertion type with 1- to 2-inch-diameter
17 dial and tapered-end sensing element. Dial ranges shall be 0 to 220 deg F.

18 Carrying case shall have formed instrument padding.

19
20 Venturi Flowmeters

21 Manufacturers:

22
23 Barco.

24 Gerand Engineering Co.

25 Preso Meters Corporation.

26 Description: Differential-pressure design for installation in piping; with calibrated flow-
27 measuring element, separate flowmeter, hoses or tubing, valves, fittings, and conversion chart
28 compatible with flow-measuring element, flowmeter, and system fluid.

29 Construction: Bronze, brass, or factory-primed steel; with brass fittings and attached tag with
30 flow conversion data.

31 Pressure Rating: 250 psig.

32 Temperature Rating: 250 deg F.

33 End Connections for NPS 2 and Smaller: Threaded.

34 End Connections for NPS 2-1/2 and Larger: Flanged or welded.

35 Range: Flow range of flow-measuring element and flowmeter shall cover operating range of
36 equipment or system served.

37 Portable Indicators: Differential-pressure type calibrated for connected flowmeter element and
38 having two 12-foot hoses in carrying case.

39
40 Scale: Gallons per minute.

41 Accuracy: Plus or minus 2 percent between 20 and 80 percent of range.

42 Procure: Procure and provide to Owner – Proof of Ownership.

43 Operating Instructions: Include complete instructions with each flowmeter.

44
45 Thermal-Energy Meter Systems (Csu)

46 In-line Turbine – Steam Energy (Condensate Return)

47 Manufacturers: Vortek Instruments marketed by Sierra instruments

48

1 Install: In line mass flow vortex meter with pressure and temperature compensation (2"
2 line)
3 P/N: 240VTP-##-E2-DD-PS-V4M-ST-MP2
4 ##: size-inch ANSI 150 lb Flanged, 316L
5 DD: Digital Display
6 PS: 100-240 VAC, 50/60 Hz Line Power, 25 Watts
7 V4M: One analog output (4-20 mA), one alarm, one pulse, and MODBUS
8 ST: Process temperature -40° to 500°F (-40° to 260°C)
9 MP2: Maximum 100 psia (7 bara), Proof 200 psia (14 bara)
10 Flowmeter Installation: Verify installation site shows for the following conditions – install per
11 manufacturers guidelines.
12 Unobstructed flow requirements.
13 Line pressure and temperature will not exceed the flow meter rating.
14 The location meets the required minimum number of pipe diameters upstream and
15 downstream of the sensor head as illustrated in installation manual.
16 Safe and convenient access with adequate overhead clearance for maintenance purposes.
17 Verify that the cable entry into the instrument meets the specific standard required for
18 hazardous area installations.
19 For remote installations, verify the supplied cable length is sufficient to connect the flow meter
20 sensor to the remote electronics.
21 Also, before installation check your flow system for anomalies such as:
22 Leaks
23 Valves or restrictions in the flow path that could create disturbances in the flow profile that
24 might cause unexpected flow rate indications.
25 Select an installation site that will minimize possible distortion in the flow profile.
26 Valves, elbows, control valves and other piping components may cause flow
27 disturbances. Check your specific piping condition against the examples in installation
28 manual. In order to achieve accurate and repeatable performance install the flow meter
29 using the recommended number of straight run pipe diameters upstream and
30 downstream of the sensor.
31 Note: For liquid applications in vertical pipes, avoid installing with flow in the
32 downward direction because the pipe may not be full at all points. Choose to install the
33 meter with flow in the upward direction if possible.
34 Manufacturer Representative: Beabout Company, Distribution for Sierra/Vortek
35 (303)795-1000.
36
37 Ultrasonic Flow Chilled Water (CW Supply):
38 Manufacturer: Endress+Hauser, Inc.
39 Install ultrasonic flow meter system. System to include:
40
41 P/N: 91WA1-BA1#20ACB4AA, Pronsonic Flow 91WA1 Clamp On, 1-channel Ultrasonic
42 Clamp On flow meter. Installation to include:
43
44 Flow Sensor: 2" to 12" pipe size, -4 deg to 176 deg F.
45 Sensor Cable: PVC, -4 to 160 deg F/length as required for installation.
46 Approvals: Non-hazardous area.
47 Protection type: NEMA 4X/Field mounted housing.
48 Power Supply; Display: 85 to 250 VAC, 2-line display, push-button configuration.

Software: Standard software.
Output/Inputs: 4-20mA HART, pulse.

P/N: RMS621-21BAA26A1, Energy manager RMS621, Energy Calculation.

Operation: Alphanumeric display; 8 buttons
Power Supply: 90-250VAC; Input 2x 0/4-20mA/PFM/pulse + 2x loop power supply;
output 2x 0/4-20mA/Pulse, 2x digital, 2x relay SPST
User Mode: 1x application, pre-installed.
Operation Language: American English.
Communication: 1x RS232 + 1x RS485 + 1x ModBus
Additional Option: Basic version

P/N: TH13-#A23E1GBD1AK, RTD-Assembly TH13, TW-Type U.S. Style temperature measuring device with thermowell. Spring loaded element. PT100 Sensor comply with IEC60751 standard, $\alpha=0.00385$. (2 Req)

Thermowell Immersion Length U: 1 – 2 ½"; 2 – 4 ½"

Process Connection: Thread ¾" NPT; 316SS.

Thermowell Shape: Tapered.

Thermowell Lag, T: 3 inch.

Sensor Type: 1 PT100 Class A, 4 wire, (-50 – 200 Deg C).

Electrical Connection: Programmable TMT181 FM IS.

Documentation: Standard.

Test Calibration: None.

Model: Standard.

Flow Meter Installation Requirements: Verify the installation site allows for the following conditions – install per manufacturers guidelines.

Line pressure and temperature will not exceed the flow meter rating.

The location meets the required minimum number of pipe diameters upstream and downstream of the sensors as illustrated in installation manual.

Safe and convenient access with adequate overhead clearance for maintenance purposes.

Verify that the cable entry into the instrument meets the specific standard required for hazardous area installations.

For remote installations, verify the supplied cable length is sufficient to connect the flow meter sensor to the remote electronics.

Also, before installation check your flow system for anomalies such as:

Leaks

Valves or restrictions in the flow path that could create disturbances in the flow profile that might cause unexpected flow rate indications.

EXECUTION

Thermometer Applications

Install direct-mounting, vapor-actuated dial thermometers in the following locations:

1
2 Inlet and outlet of each hydronic zone.

3 Inlet and outlet of each hydronic coil in air-handling units and built-up central systems.

4 Inlet and outlet of each hydronic heat exchanger.

5 Install dry case-type, bimetallic actuated dial thermometers at suction and discharge of each
6 pump.

7 Install round temperature thermometers in supply and return duct systems.

8 Provide the following temperature ranges for thermometers:

9
10 Heating Hot Water: 30 to 240 deg F, with 2-degree scale divisions.

11 Chilled Water: 0 to 100 deg F, with 2-degree scale divisions.

12 Steam and Condensate: 30 to 300 deg F, with 5-degree scale divisions.

13 Air Ducts: Minus 40 to plus 110 deg F, with 2-degree scale divisions.

14
15 Gage Applications

16 Install dry-case-type pressure gages for discharge of each pressure-reducing valve.

17 Install dry-case-type pressure gages at suction and discharge of each pump.

18
19 Installations

20 Install direct-mounting thermometers and adjust vertical and tilted positions.

21 Install thermowells with socket extending one-third of diameter of pipe and in vertical position
22 in piping tees where thermometers are indicated.

23 Duct Thermometer Support Flanges: Install in wall of duct where duct thermometers are
24 indicated. Attach to duct with screws.

25 Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most
26 readable position.

27 Install needle-valve and snubber fitting in piping for each pressure gage for fluids (except
28 steam).

29 Install needle-valve and syphon fitting in piping for each pressure gage for steam.

30 Install test plugs in tees in piping.

31 Assemble and install connections, tubing, and accessories between flow-measuring elements
32 and flowmeters as prescribed by manufacturer's written instructions.

33 Install flowmeter elements in accessible positions in piping systems.

34 Install differential-pressure-type flowmeter elements with at least minimum straight lengths of
35 pipe upstream and downstream from element as prescribed by manufacturer's written
36 instructions.

37 Install connection fittings for attachment to portable indicators in accessible locations.

38 Install flowmeters at discharge of hydronic system pumps.

39 Assemble components and install thermal-energy meters (condensate return).

40 Mount meters on wall if accessible; if not, provide brackets to support meters.

41
42 Connections

43 Install meters and gages adjacent to machines and equipment to allow service and maintenance
44 for meters, gages, machines, and equipment.

45 Connect flowmeter-system elements to meters.

46 Connect flowmeter transmitters to meters.

47 Connect thermal-energy-meter transmitters to meters.

48 Ground equipment according to Division 26 Section "Grounding and Bonding."

1910

- 1 Connect wiring according to Division 26 Section "Conductors and Cables."
- 2
- 3 Adjusting
- 4 Calibrate meters according to manufacturer's written instructions, after installation.
- 5 Adjust faces of meters and gages to proper angle for best visibility.
- 6
- 7 END OF SECTION

1 SECTION 23 0523 - VALVES

2
3 GENERAL

4
5 Summary

6 This Section includes the following general-duty valves:

- 7 Copper-alloy ball valves.
- 8 Ferrous-alloy butterfly valves.
- 9 Bronze check valves.
- 10 Ferrous-alloy wafer check valves.
- 11 Bronze gate valves.
- 12 Cast-iron gate valves.
- 13 Bronze globe valves.
- 14 Resilient-seated, cast-iron, eccentric plug valves.
- 15 Chainwheel actuators.

16
17 Definitions

18 The following are standard abbreviations for valves:

- 19 CWP: Cold working pressure.
- 20 EPDM: Ethylene-propylene-diene terpolymer rubber.
- 21 NBR: Acrylonitrile-butadiene rubber.
- 22 PTFE: Polytetrafluoroethylene plastic.
- 23 SWP: Steam working pressure.
- 24 TFE: Tetrafluoroethylene plastic.

25
26 Submittals

27 Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve
28 design; pressure and temperature classifications; end connections; arrangement; dimensions;
29 and required clearances. Include list indicating valve and its application. Include rated
30 capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
31

32 Quality Assurance

33 ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services
34 piping valves.

35 Exceptions: Domestic hot- and cold-water piping valves unless referenced.

36 ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design
37 criteria.

38 NSF Compliance: NSF 61 for valve materials for potable-water service.
39

40 PRODUCTS

41
42 Valves, General

43 Refer to Part 3 "Valve Applications" Article for applications of valves.

44 Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

45 Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

46 Valve Pressure and Temperature Ratings: Not less than indicated and as required for system
47 pressures and temperatures.

48 Valve Sizes: Same as upstream pipe, unless otherwise indicated.

1 Valve Actuators:

2 Chainwheel: For attachment to valves, of size and mounting height, as indicated in the
3 "Valve Installation" Article in Part 3.

4 Gear Drive: For quarter-turn valves NPS 8 and larger.

5 Handwheel: For valves other than quarter-turn types.

6 Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.

7 Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10
8 plug valves, for each size square plug head.

9 Extended Valve Stems: On insulated valves.

10 Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24
11 for bronze valves.

12
13 Copper-Alloy Ball Valves

14 Manufacturers:

15 Two-Piece, Copper-Alloy Ball Valves:

16 Conbraco Industries, Inc.; Apollo Div.

17 Crane Co.; Crane Valve Group; Crane Valves.

18 NIBCO INC.

19 Stockham

20 Walworth

21 Copper-Alloy Ball Valves, General: MSS SP-110.

22 Two-Piece, Copper-Alloy Ball Valves: Bronze body with full-port, chrome-plated bronze ball; TFE
23 seats; and 600-psig 150 CWP rating and blowout-proof stem.

24
25 Ferrous-Alloy Butterfly Valves

26 Available Manufacturers:

27 LUG, Ferrous-Alloy Butterfly Valves:

28 General Signal; DeZurik Unit.

29 Jamesbery

30 Keystone

31 Milwaukee Valve Company.

32 Ferrous-Alloy Butterfly Valves, General: MSS SP-67, Type I, for tight shutoff, with disc and lining
33 suitable for potable water, unless otherwise indicated.

34 Single-Flange, 200-psig CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer-lug type with one-
35 piece stem.

36
37 Bronze Check Valves

38 Manufacturers:

39 Type 3, Bronze, Swing Check Valves with Metal Disc:

40 Crane Valves.

41 Stockham Div.

42 Milwaukee Valve Company.

43 NIBCO INC.

44 Type 4, Bronze, Swing Check Valves with Nonmetallic Disc:

45 Crane Valves.

46 Stockham Div.

47 Milwaukee Valve Company.

48 NIBCO INC.

- 1 Bronze Check Valves, General: MSS SP-80.
 2 Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.
 3 Type 4, Class 150, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze
 4 seat.

5
 6 Ferrous-Alloy Wafer Check Valves

7 Manufacturers:

8 Single-Plate, Ferrous-Alloy, Wafer Check Valves:

9 Crane Valves.

10 Stockham

11 Dual-Plate, Ferrous-Alloy, Wafer Check Valves:

12 Crane Valves.

13 Stockham Div.

14 Dual-Plate, Ferrous-Alloy, Double-Flanged-Type Check Valves:

15 Crane Valves.

16 Stockham

17 Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.

18 Single-Plate, Class 125 or 150, Ferrous-Alloy, Wafer Check Valves: Flangeless body.

19 Single-Plate, Class 125, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

20 Dual-Plate, Class 250 or 300, Ferrous-Alloy, Wafer Check Valves: Flangeless body.

21

22 Bronze Gate Valves

23 Manufacturers:

24 Type 2, Bronze, Rising-Stem, Solid-Wedge Gate Valves:

25 Crane Valves.

26 Jenkins Valves.

27 Stockham Div.

28 Lunkenheimer

29 Milwaukee Valve Company.

30 NIBCO INC.

31 Walworth Co.

32 Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

33 Type 2, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge
 34 and union-ring bonnet.

35

36 Cast-Iron Gate Valves

37 Manufacturers:

38 Type I, Cast-Iron, Rising-Stem Gate Valves:

39 Crane Valves.

40 Jenkins Valves.

41 Stockham Div.

42 Lunkenheimer

43 Milwaukee Valve Company.

44 NIBCO INC.

45 Walworth Co.

46 Cast-Iron Gate Valves, General: MSS SP-70, Type I.

47 Class 125, OS&Y, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim,
 48 rising stem, and solid-wedge disc.

Bronze Globe Valves

Manufacturers:

Bronze Globe Valves with Nonmetallic Disc:

Crane Valves.

Jenkins Valves.

Stockham Div.

Lunkenheimer

Milwaukee Valve Company.

NIBCO INC.

Walworth Co.

Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.

Type 2, Class 150, Bronze Globe Valves: Bronze body with nonmetallic TFE disc and union-ring bonnet.

Cast-Iron Globe Valves

Manufacturers:

Type I, Cast-Iron Globe Valves with Metal Seats:

Crane Valves.

Jenkins Valves.

Stockham Div.

Lunkenheimer

Milwaukee Valve Company.

NIBCO INC.

Walworth Co.

Cast-Iron Globe Valves, General: MSS SP-85.

Class 250, Cast-Iron Globe Valves: Gray-iron body with bronze seats.

Resilient-Seated, Cast-Iron, Eccentric Plug Valves

Manufacturers:

General Signal; DeZurik Unit.

Milliken Valve Company.

Pratt, Henry Company.

Resilient-Seated, Cast-Iron, Eccentric Plug Valves, NPS 2 1/2 and Larger: MSS SP-108, and rated for 175-psig minimum CWP.

Resilient Seating Material: Suitable for potable-water service, unless otherwise indicated.

Chainwheel Actuators

Manufacturers:

Babbitt Steam Specialty Co.

Roto Hammer Industries, Inc.

Description: Valve actuation assembly with sprocket rim, brackets, and chain.

Sprocket Rim with Chain Guides: of type and size required for valve. Include zinc coating.

Brackets: Type, number, size, and fasteners required to mount actuator on valve.

Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

1 EXECUTION

3 Examination

4 Examine piping system for compliance with requirements for installation tolerances and other
5 conditions affecting performance.

6 Proceed with installation only after unsatisfactory conditions have been corrected.

7 Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove
8 special packing materials, such as blocks, used to prevent disc movement during shipping and
9 handling.

10 Operate valves in positions from fully open to fully closed. Examine guides and seats made
11 accessible by such operations.

12 Examine threads on valve and mating pipe for form and cleanliness.

13 Examine mating flange faces for conditions that might cause leakage. Check bolting for proper
14 size, length, and material. Verify that gasket is of proper size, that its material composition is
15 suitable for service, and that it is free from defects and damage.

16 Do not attempt to repair defective valves; replace with new valves.

18 Valve Applications

19 Refer to piping Sections for specific valve applications. If valve applications are not indicated,
20 use the following:

21 Shutoff Service: Ball, butterfly, or gate valves. Gate valves only for steam service.

22 Throttling Service: Ball, butterfly, or globe valves.

23 Pump Discharge: Spring-loaded, lift-disc check valves.

24 If valves with specified SWP classes or CWP ratings are not available, the same types of valves
25 with higher SWP class or CWP ratings may be substituted.

26 Chilled-Water Piping: Use the following types of valves:

27 Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.

28 Butterfly Valves, NPS 2-1/2 and Larger: Flanged, 200-psig CWP rating, ferrous alloy, with
29 EPDM liner.

30 Globe Valves, NPS 2 and Smaller: Type 2, Class 125, bronze.

31 Domestic Water Piping: Use the following types of valves:

32 Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.

33 Butterfly Valves, NPS 2-1/2 and Larger: Flanged, 200-psig CWP rating, ferrous alloy, with
34 EPDM liner.

35 Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.

36 Heating Water Piping: Use the following types of valves:

37 Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.

38 Butterfly Valves, NPS 2-1/2 and Larger: Flanged, 200-psig CWP rating, ferrous alloy, with
39 EPDM liner.

40 Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.

41 Resilient-Seated, Eccentric Plug Valves, NPS 3 and Larger: 175-psig CWP rating, cast
42 iron.

43 Medium-Pressure Steam Piping: Use the following types of valves:

44 Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.

45 Gate Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.

46 Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.

47 Steam Condensate Piping: Use the following types of valves:

48 Ball Valves, NPS 2 and Smaller: Two-piece, 600-psig CWP rating, copper alloy.

- 1 High-Pressure Butterfly Valves, NPS 3 and Larger: Single-flange, Class 300.
2 Gate Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
3 Gate Valves, NPS 2-1/2 and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
4 Select valves, except wafer and flangeless types, with the following end connections:
5 For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends, except provide
6 valves with threaded ends for condenser water, heating hot water, steam, and steam
7 condensate services.
8 For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.

9

10 Valve Installation

- 11 Piping installation requirements are specified in other Division 15 Sections. Drawings indicate
12 general arrangement of piping, fittings, and specialties.
13 Install valves with unions or flanges at each piece of equipment arranged to allow service,
14 maintenance, and equipment removal without system shutdown.
15 Locate valves for easy access and provide separate support where necessary.
16 Install valves in horizontal piping with stem at or above center of pipe.
17 Install valves in position to allow full stem movement.
18 Install chainwheel operators on valves NPS 4 and larger and more than 84 inches above floor.
19 Extend chains to 72 inches above finished floor elevation.
20 Install check valves for proper direction of flow and as follows:
21 Swing Check Valves: In horizontal position with hinge pin level.
22 Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
23 Lift Check Valves: With stem upright and plumb.

24

25 Joint Construction

- 26 Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping joint
27 construction.
28 Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy
29 solder; and ASTM B 828 procedure, unless otherwise indicated.

30

31 Adjusting

- 32 Adjust or replace valve packing after piping systems have been tested and put into service but
33 before final adjusting and balancing. Replace valves if persistent leaking occurs.

34

35 END OF SECTION

1 SECTION 23 0529 - HANGERS AND SUPPORTS

2
3 GENERAL

4
5 Summary

6 This Section includes the following hangers and supports for mechanical system piping
7 and equipment:

8 Steel pipe hangers and supports.

9 Trapeze pipe hangers.

10 Thermal-hanger shield inserts.

11 Fastener systems.

12 Pipe stands.

13 Pipe positioning systems.

14 Equipment supports.

15
16 Performance Requirements

17 Design supports for multiple pipes, including pipe stands, capable of supporting
18 combined weight of supported systems, system contents, and test water.

19
20 Submittals

21 Product Data: For the following:

22 Steel pipe hangers and supports.

23 Fiberglass pipe hangers.

24 Thermal-hanger shield inserts.

25
26 PRODUCTS

27
28 Manufacturers

29 In other Part 2 articles where titles below introduce lists, the following requirements
30 apply to product selection:

31 Manufacturers: Subject to compliance with requirements, provide products by one of
32 the manufacturers specified.

33
34 Steel Pipe Hangers And Supports

35 Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to
36 Part 3 "Hanger and Support Applications" Article for where to use specific hanger and
37 support types.

38 Manufacturers:

39 B-Line Systems, Inc.; a division of Cooper Industries.

40 Grinnell Corp.

41 National Pipe Hanger Corporation.

42 Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

43 Nonmetallic Coatings: Plastic coating, jacket, or liner.

44 Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for
45 support of bearing surface of piping.

46
47 Hdpe Pipe Hangers And Supports

48 Manufacturers:

1 B-Line Systems, Inc.; a division of Cooper Industries.

2 Grinnell Corp.

3 National Pipe Hanger Corporation.

4 Pipe supports in this section apply to existing 16" and 24" chilled water piping in the
5 chilled water valve vault to be constructed in limits of work part B.

6 Hangers

7 Uninsulated pipes 2 1/2 inch and larger.

8 Adjustable steel yoke pipe roll, Cooper B-Line B3110.

9 Pipe Clamps

10 When flexibility in the hanger assembly is required due to horizontal movement, use
11 pipe clamps with weldless eye nuts, Cooper B-Line B3140 or B3142 with B3200.

12 Floor Supports

13 Hot piping under 6 inch and all cold piping:

14 Carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for
15 pipe elevation, Cooper B-Line B3092 and B3088T or B3090 and B3088. Pipe saddle shall
16 be screwed or welded to appropriate base stand.

17 Upper Attachments

18 Concrete inserts

19 Continuous concrete inserts shall be used. Channels shall be 12 gauge ASTM A 1011 SS
20 Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps
21 with nail holes for attachment to forms. The continuous concrete insert shall have a
22 load rating of 2,000 lbs/ft. in concrete, Cooper B-Line B221, B321, or B521 (B521 is
23 limited to
24 1,500 lbs./ft.). Select channel nuts suitable for strut and rod sizes.

25 Accessories

26 Hanger rods shall be threaded on both ends, Cooper B-Line B3205 or continuous
27 threaded rods of circular cross section. Use adjusting locknuts at upper attachments and
28 hangers. No wire, chain, or perforated straps are allowed.

29 Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness,
30 sized for insulation thickness. Saddles for pipe sized greater than 12 inch shall have a
31 center support rib.

32 Trapeze Pipe Hangers

34 Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made
35 from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

36 Thermal-Hanger Shield Inserts

37 Description: 100-psig minimum, compressive-strength insulation insert encased in
38 sheet metal shield.

39 Manufacturers:

40 Carpenter & Paterson, Inc.

41 ERICO/Michigan Hanger Co.

42 PHS Industries, Inc.

43 Pipe Shields, Inc.

44 Rilco Manufacturing Company, Inc.

45 Value Engineered Products, Inc.

46 Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I
47 calcium silicate with vapor barrier.
48

1 Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I
2 calcium silicate.

3 For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of
4 pipe.

5 For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

6 Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below
7 ambient air temperature.

8 9 Fastener Systems

10 Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement
11 concrete with pull-out, tension, and shear capacities appropriate for supported loads
12 and building materials where used.

13 Manufacturers:

14 Hilti, Inc.

15 ITW Ramset/Red Head.

16 Masterset Fastening Systems, Inc.

17 MKT Fastening, LLC.

18 Powers Fasteners.

19 Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in
20 hardened portland cement concrete with pull-out, tension, and shear capacities
21 appropriate for supported loads and building materials where used.

22 Manufacturers:

23 B-Line Systems, Inc.; a division of Cooper Industries.

24 Empire Industries, Inc.

25 Hilti, Inc.

26 ITW Ramset/Red Head.

27 MKT Fastening, LLC.

28 Powers Fasteners.

29 30 Pipe Stand Fabrication

31 Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured
32 corrosion-resistant components to support roof-mounted piping.

33 34 Pipe Positioning Systems

35 Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning
36 piping in pipe spaces for plumbing fixtures for commercial applications.

37 Manufacturers:

38 C & S Mfg. Corp.

39 HOLDRITE Corp.; Hubbard Enterprises.

40 Samco Stamping, Inc.

41 42 Equipment Supports

43 Description: Welded, shop- or field-fabricated equipment support made from
44 structural-steel shapes.

45 46 Miscellaneous Materials

47 Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1 Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink
2 and nonmetallic grout; suitable for interior and exterior applications.

3 Properties: Nonstaining, noncorrosive, and nongaseous.

4 Design Mix: 5000-psi, 28-day compressive strength.

6 EXECUTION

8 Hanger And Support Applications

9 Specific hanger and support requirements are specified in Sections specifying piping
10 systems and equipment.

11 Comply with MSS SP-69 for pipe hanger selections and applications that are not
12 specified in piping system Sections.

13 Use hangers and supports with galvanized, metallic coatings for piping and equipment
14 that will not have field-applied finish.

15 Use nonmetallic coatings on attachments for electrolytic protection where attachments
16 are in direct contact with copper tubing.

17 Use padded hangers for piping that is subject to scratching.

18 Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as
19 specified in piping system Sections, install the following types:

20 Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of insulated stationary
21 pipes, NPS 1/2 to NPS 30.

22 Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4
23 to NPS 16, requiring up to 4 inches of insulation.

24 Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes,
25 NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.

26 Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-
27 center closure for hanger installation before pipe erection.

28 U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.

29 Clips (MSS Type 26): For support of insulated pipes not subject to expansion or
30 contraction.

31 Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel
32 pipe base stanchion support and cast-iron floor flange.

33 Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel
34 pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.

35 Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes,
36 NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion
37 support and cast-iron floor flange.

38 Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if
39 longitudinal movement caused by expansion and contraction might occur.

40 Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20,
41 from single rod if horizontal movement caused by expansion and contraction might
42 occur.

43 Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to
44 NPS 30, if vertical and lateral adjustment during installation might be required in
45 addition to expansion and contraction.

46 Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping
47 system Sections, install the following types:

1 Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to
2 NPS 20.

3 Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4
4 to NPS 20, if longer ends are required for riser clamps.

5 Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping
6 system Sections, install the following types:

7 Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
8 Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
9 Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
10 Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of
11 building attachments.

12 Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

13 Building Attachments: Unless otherwise indicated and except as specified in piping
14 system Sections, install the following types:

15 Concrete Inserts:
16 Provide inserts for placement in formwork before concrete is poured.
17 Provide inserts for suspending hangers from reinforced concrete slabs and sides of
18 reinforced concrete beams.
19 Where concrete slabs from finished ceilings, provide inserts to be flush with slab
20 surface.
21 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4
22 inches.

23 Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams,
24 channels, or angles.

25 Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
26 Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads
27 are considerable and rod sizes are large.

28 C-Clamps (MSS Type 23): For structural shapes.

29 Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to
30 flange edge.

31 Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

32 Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-
33 beams for heavy loads.

34 Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-
35 beams for heavy loads, with link extensions.

36 Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to
37 structural steel.

38 Welded-Steel Brackets: For support of pipes from below, or for suspending from above
39 by using clip and rod. Use one of the following for indicated loads:

40 Light (MSS Type 31): 750 lb.
41 Medium (MSS Type 32): 1500 lb.
42 Heavy (MSS Type 33): 3000 lb.

43 Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

44 Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

45 Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear
46 horizontal movement where headroom is limited.

47 Saddles and Shields: Unless otherwise indicated and except as specified in piping
48 system Sections, install the following types:

1 Thermal-Hanger Shield Inserts: For supporting insulated pipe.
 2 Spring Hangers and Supports: Unless otherwise indicated and except as specified in
 3 piping system Sections, install the following types:
 4 Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-
 5 1/4 inches.
 6 Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with
 7 springs.
 8 Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal
 9 expansion in piping systems.
 10 Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not
 11 specified in piping system Sections.
 12 Comply with MFMA-102 for metal framing system selections and applications that are
 13 not specified in piping system Sections.
 14 Use powder-actuated fasteners or mechanical-expansion anchors instead of building
 15 attachments where required in concrete construction.
 16 Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply
 17 and waste piping for plumbing fixtures.
 18

19 Hanger And Support Installation

20 Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers,
 21 supports, clamps, and attachments as required to properly support piping from building
 22 structure.
 23 Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for
 24 grouping of parallel runs of horizontal piping and support together on field-fabricated
 25 trapeze pipe hangers.
 26 Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or
 27 install intermediate supports for smaller diameter pipes as specified above for individual
 28 pipe hangers.
 29 Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported.
 30 Weld steel according to AWS D1.1.
 31 Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
 32 Fastener System Installation:
 33 Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less
 34 than 4 inches thick in concrete after concrete is placed and completely cured. Use
 35 operators that are licensed by powder-actuated tool manufacturer. Install fasteners
 36 according to powder-actuated tool manufacturer's operating manual.
 37 Install mechanical-expansion anchors in concrete after concrete is placed and
 38 completely cured. Install fasteners according to manufacturer's written instructions.
 39 Pipe Stand Installation:
 40 Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on
 41 smooth roof surface. Do not penetrate roof membrane.
 42 Pipe Positioning System Installation: Install support devices to make rigid supply and
 43 waste piping connections to each plumbing fixture. Refer to Division 15 Section
 44 "Plumbing Fixtures" for plumbing fixtures.
 45 Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers,
 46 and other accessories.
 47 Equipment Support Installation: Fabricate from welded-structural-steel shapes.

1 Install hangers and supports to allow controlled thermal movement of piping systems,
2 to permit freedom of movement between pipe anchors, and to facilitate action of
3 expansion joints, expansion loops, expansion bends, and similar units.

4 Install lateral bracing with pipe hangers and supports to prevent swaying.

5 Install building attachments within concrete slabs or attach to structural steel. Install
6 additional attachments at concentrated loads, including valves, flanges, and strainers,
7 NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts
8 before concrete is placed; fasten inserts to forms and install reinforcing bars through
9 openings at top of inserts.

10 Load Distribution: Install hangers and supports so piping live and dead loads and
11 stresses from movement will not be transmitted to connected equipment.

12 Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so
13 maximum pipe deflections allowed by ASME B31.9 are not exceeded.

14 Insulated Piping: Comply with the following:

15 Attach clamps and spacers to piping.

16 Piping Operating above Ambient Air Temperature: Clamp may project through
17 insulation.

18 Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert
19 with clamp sized to match OD of insert.

20 Do not exceed pipe stress limits according to ASME B31.1 for power piping and
21 ASME B31.9 for building services piping.

22 Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields
23 shall span an arc of 180 degrees.

24 Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution
25 plate for pipe NPS 4 and larger if pipe is installed on rollers.

26 Shield Dimensions for Pipe: Not less than the following:

27 NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

28 NPS 4: 12 inches long and 0.06 inch thick.

29 NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

30 Insert Material: Length at least as long as protective shield.

31 Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
32

33 Equipment Supports

34 Fabricate structural-steel stands to suspend equipment from structure overhead or to
35 support equipment above floor.

36 Grouting: Place grout under supports for equipment and make smooth bearing surface.

37 Provide lateral bracing, to prevent swaying, for equipment supports.
38

39 Metal Fabrications

40 Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and
41 equipment supports.

42 Fit exposed connections together to form hairline joints. Field weld connections that
43 cannot be shop welded because of shipping size limitations.

44 Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding,
45 appearance and quality of welds, and methods used in correcting welding work, and
46 with the following:

47 Use materials and methods that minimize distortion and develop strength and corrosion
48 resistance of base metals.

1910

- 1 Obtain fusion without undercut or overlap.
- 2 Remove welding flux immediately.
- 3 Finish welds at exposed connections so no roughness shows after finishing and contours
- 4 of welded surfaces match adjacent contours.
- 5

6 Adjusting

- 7 Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to
- 8 achieve indicated slope of pipe.
- 9 Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.
- 10

11 END OF SECTION

1 SECTION 23 0553 - MECHANICAL IDENTIFICATION

2
3 GENERAL

4
5 Summary

6 This Section includes the following mechanical identification materials and their installation:

- 7 Equipment markers.
- 8 Access panel and door markers.
- 9 Pipe markers.
- 10 Duct markers.
- 11 Stencils.
- 12 Valve tags.
- 13 Valve schedules.

14
15 Submittals

- 16 Product Data: For each type of product indicated.
- 17 Valve numbering scheme.
- 18 Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies)
- 19 to include in maintenance manuals.

20
21 Coordination

- 22 Coordinate installation of identifying devices with completion of covering and painting of
- 23 surfaces where devices are to be applied.
- 24 Coordinate installation of identifying devices with location of access panels and doors.
- 25 Install identifying devices before installing acoustical ceilings and similar concealment.

26
27 PRODUCTS

28
29 Equipment Identification Devices

30 Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent

31 adhesive.

32 Terminology: Match schedules as closely as possible.

33 Data:

34 Name and plan number.

35 Equipment service.

36 Design capacity.

37 Other design parameters such as pressure drop, entering and leaving

38 conditions, and speed.

39 Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for

40 equipment.

41 Access Panel and Door Markers: 1/16-inch-thick, engraved laminated plastic, with abbreviated

42 terms and numbers corresponding to identification. Provide 1/8-inch center hole for

43 attachment.

44 Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

45
46 Piping Identification Devices

47 Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service,

48 and showing direction of flow.

1 Colors: Comply with ASME A13.1, unless otherwise indicated.

2 Lettering: Use piping system terms indicated and abbreviate only as necessary for each
3 application length.

4 Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers
5 extending 360 degrees around pipe at each location.

6 Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type
7 pipe markers at least three times letter height and of length required for label.

8 Arrows: Integral with piping system service lettering to accommodate both directions;
9 or as separate unit on each pipe marker to indicate direction of flow.

10 Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive
11 back.

12 Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive,
13 permanent-type, self-adhesive back.

14 Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch
15 minimum.

16 Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2
17 inches minimum.

18 19 Duct Identification Devices

20 Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of
21 airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent
22 adhesive.

23 24 Valve Tags

25 Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-
26 inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for
27 fastener.

28 Material: 0.032-inch- thick brass.

29 Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

30 31 Valve Schedules

32 Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number,
33 piping system, system abbreviation (as shown on valve tag), location of valve (room or space),
34 normal-operating position (open, closed, or modulating), and variations for identification. Mark
35 valves for emergency shutoff and similar special uses.

36 Valve-Schedule Frames: Glazed display frame for removable mounting on masonry
37 walls for each page of valve schedule. Include mounting screws.

38 Frame: Extruded aluminum.

39 Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

40 41 Warning Tags

42 Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card
43 stock with matte finish suitable for writing.

44 Size: Approximately 4 by 7 inches.

45 Fasteners: Brass grommet and wire.

46 Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT
47 OPERATE.

48 Color: Yellow background with black lettering.

1 EXECUTION

2
3 Applications, General

4 Install equipment markers with permanent adhesive on or near each major item of mechanical
5 equipment.

6 Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24
7 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger
8 lettering for greater viewing distances. Include secondary lettering two-thirds to three-
9 fourths the size of principal lettering.

10 Data: Distinguish among multiple units, indicate operational requirements, indicate
11 safety and emergency precautions, warn of hazards and improper operations, and
12 identify units.

13 Locate markers where accessible and visible. Include markers for the following general
14 categories of equipment:

15 Main control and operating valves, including safety devices and hazardous units
16 such as gas outlets.

17 Fire department hose valves and hose stations.

18 Meters, gages, thermometers, and similar units.

19 Pumps, compressors, chillers, condensers, and similar motor-driven units.

20 Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and
21 similar equipment.

22 Fans, blowers, primary balancing dampers, and mixing boxes.

23 Packaged HVAC central-station and zone-type units.

24 Tanks and pressure vessels.

25 Install access panel markers with screws on equipment access panels.

26
27 Piping Identification

28 Install manufactured pipe markers indicating service on each piping system. Install with flow
29 indication arrows showing direction of flow.

30 Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers.

31 Use color-coded, self-adhesive plastic tape, at least 3/4 inch-1-1/2 incheswide, lapped at
32 least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.

33 Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers.

34 Use color-coded, self-adhesive plastic tape, at least 1-1/2 incheswide, lapped at least 3
35 inches at both ends of pipe marker, and covering full circumference of pipe.

36 Locate pipe markers and color bands where piping is exposed in finished spaces; machine
37 rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior
38 nonconcealed locations as follows:

39 Near each valve and control device.

40 Near each branch connection, excluding short takeoffs for fixtures and terminal units.

41 Where flow pattern is not obvious, mark each pipe at branch.

42 Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.

43 At access doors, manholes, and similar access points that permit view of concealed
44 piping.

45 Near major equipment items and other points of origination and termination.

46 Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in
47 areas of congested piping and equipment.

48 On piping above removable acoustical ceilings. Omit intermediately spaced markers.

1 Duct Identification

2 Install duct markers with permanent adhesive on air ducts in the following color codes:

3 Green: For cold-air supply ducts.

4 Yellow: For return ducts.

5 Blue: For exhaust-, outside-, relief-, , and mixed-air ducts.

6 Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24

7 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger

8 lettering for greater viewing distances. Include secondary lettering two-thirds to three-

9 fourths the size of principal lettering.

10 Locate markers near points where ducts enter into concealed spaces and at maximum intervals

11 of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

12

13 Valve-Tag Installation

14 Install tags on valves and control devices in piping systems, except check valves; valves within

15 factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets;

16 convenience and lawn-watering hose connections; and HVAC terminal devices and similar

17 roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

18

19 Valve-Schedule Installation

20 Mount valve schedule on wall in accessible location in each major equipment room.

21

22 Warning-Tag Installation

23 Write required message on, and attach warning tags to, equipment and other items where

24 required.

25

26 Adjusting

27 Relocate mechanical identification materials and devices that have become visually blocked by

28 other work.

29

30 END OF SECTION

1 SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING

2
3 GENERAL

4
5 Summary

6 This Section includes TAB to produce design objectives for the following:

7 Air Systems:

8 Constant-volume air systems.

9 Variable-air-volume systems.

10 Hydronic Piping Systems:

11 Constant-flow systems.

12 Variable-flow systems.

13 HVAC equipment quantitative-performance settings.

14 Space pressurization testing and adjusting.

15 Vibration measuring.

16 Verifying that automatic control devices are functioning properly.

17 Reporting results of activities and procedures specified in this Section.

18
19 Definitions

20 Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce
21 fan speed or adjust a damper.

22 Balance: To proportion flows within the distribution system, including submains, branches, and
23 terminals, according to indicated quantities.

24 Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and
25 ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors,
26 and other pollutants.

27 Draft: A current of air, when referring to localized effect caused by one or more factors of high
28 air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn
29 from a person's skin than is normally dissipated.

30 NC: Noise criteria.

31 Procedure: An approach to and execution of a sequence of work operations to yield repeatable
32 results.

33 RC: Room criteria.

34 Report Forms: Test data sheets for recording test data in logical order.

35 Smoke-Control System: An engineered system that uses fans to produce airflow and pressure
36 differences across barriers to limit smoke movement.

37 Stair Pressurization System: A type of smoke-control system that is intended to positively
38 pressurize stair towers with outdoor air by using fans to keep smoke from contaminating the
39 stair towers during an alarm condition.

40 Static Head: The pressure due to the weight of the fluid above the point of measurement. In a
41 closed system, static head is equal on both sides of the pump.

42 Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

43 System Effect: A phenomenon that can create undesired or unpredicted conditions that cause
44 reduced capacities in all or part of a system.

45 System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a
46 fan when installed under conditions different from those presented when the fan was
47 performance tested.

48 TAB: Testing, adjusting, and balancing.

1 Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the
2 distribution system.

3 Test: A procedure to determine quantitative performance of systems or equipment.

4 Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and
5 reporting TAB procedures.

6 Submittals

8 Qualification Data: Within 15 days from Contractor's Notice to Proceed, submit 4 copies of
9 evidence that TAB firm and this Project's TAB team members meet the qualifications specified in
10 "Quality Assurance" Article.

11 Contract Documents Examination Report: Within 30 days from Contractor's Notice to Proceed,
12 submit 4 copies of the Contract Documents review report as specified in Part 3.

13 Strategies and Procedures Plan: Within 90 days from Contractor's Notice to Proceed, submit 4
14 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article.
15 Include a complete set of report forms intended for use on this Project.

16 Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on
17 approved forms certified by TAB firm.

18 Sample Report Forms: Submit two sets of sample TAB report forms.

19 Warranties specified in this Section.

20 Progress Reports – Report in writing to Engineer and Project Manager Deficiencies or problems
21 with air or water systems that affect balance work. Include items that affect system
22 performance such as broken thermostats, damaged duct work, excessive noise, etc.

23 Full Scale Drawings – Submit one set of drawings with all labeling and identification. Obtain as-
24 built drawings from Project Manager.

25 Quality Assurance

27 TAB Firm Qualifications: The TAB firm shall be certified by NEBB or ABBC.

28 TAB Conference: Meet with Owner's and Architect's representatives on approval of TAB
29 strategies and procedures plan to develop a mutual understanding of the details. Ensure the
30 participation of TAB team members, equipment manufacturers' authorized service
31 representatives, HVAC controls installers, commissioning agent, and other support personnel.
32 Provide seven days' advance notice of scheduled meeting time and location.

33 Agenda Items: Include at least the following:

34 Submittal distribution requirements.

35 The Contract Documents examination report.

36 TAB plan.

37 Work schedule and Project-site access requirements.

38 Coordination and cooperation of trades and subcontractors.

39 Coordination of documentation and communication flow.

40 Certification of TAB Reports: Certify TAB field data reports. This certification includes the
41 following:

42 Review field data reports to validate accuracy of data and to prepare certified TAB
43 reports.

44 Certify that TAB team complied with approved TAB plan and the procedures specified
45 and referenced in this Specification.

46 TAB Report Forms: Use standard forms from NEBB's "Procedural Standards for Testing,
47 Adjusting, and Balancing of Environmental Systems" and/or SMACNA's "HVAC Systems - Testing,
48 Adjusting, and Balancing."

1 Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards
2 for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required
3 Instrumentation for NEBB Certification."

4 Instrumentation Calibration: Calibrate instruments at least every six months or more frequently
5 if required by instrument manufacturer.

6 Keep an updated record of instrument calibration that indicates date of calibration and
7 the name of party performing instrument calibration.

8 9 Acceptable Tab Contractors

10 The Test and Balance contractor is contracted directly to APS. This specification is provided for
11 information only.

12 13 Coordination

14 Coordinate all activities with the Commissioning Agent. See Division 01, General Commissioning
15 Requirements.

16 Coordinate the efforts of factory-authorized service representatives for systems and equipment,
17 HVAC controls installers, and other mechanics to operate HVAC systems and equipment to
18 support and assist TAB activities.

19 Notice: Provide seven days' advance notice for each test. Include scheduled test dates and
20 times.

21 Perform TAB after leakage and pressure tests on air and water distribution systems have been
22 satisfactorily completed.

23 24 Warranty

25 National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards
26 for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that
27 AABC will assist in completing requirements of the Contract Documents if TAB firm fails to
28 comply with the Contract Documents. Guarantee includes the following provisions:

29 Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in
30 completing requirements of the Contract Documents if TAB firm fails to comply with the
31 Contract Documents. Guarantee shall include the following provisions:

32 The certified TAB firm has tested and balanced systems according to the Contract
33 Documents.

34 Systems are balanced to optimum performance capabilities within design and
35 installation limits.

36 37 PRODUCTS (Not Applicable)

38 39 EXECUTION

40 41 Examination

42 Examine the Contract Documents to become familiar with Project requirements and to discover
43 conditions in systems' designs that may preclude proper TAB of systems and equipment.

44 Contract Documents are defined in the General and Supplementary Conditions of
45 Contract.

46 Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-
47 control devices, balancing valves and fittings, and manual volume dampers, are required
48 by the Contract Documents. Verify that quantities and locations of these balancing

1 devices are accessible and appropriate for effective balancing and for efficient system
2 and equipment operation.

3 Examine approved submittal data of HVAC systems and equipment.

4 Examine Project Record Documents described in Division 1 Section "Project Record Documents."
5 Examine design data, including HVAC system descriptions, statements of design assumptions for
6 environmental conditions and systems' output, and statements of philosophies and assumptions
7 about HVAC system and equipment controls.

8 Examine equipment performance data including fan and pump curves. Relate performance data
9 to Project conditions and requirements, including system effects that can create undesired or
10 unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system
11 effect factors to reduce performance ratings of HVAC equipment when installed under
12 conditions different from those presented when the equipment was performance tested at the
13 factory. To calculate system effects for air systems, use tables and charts found in AMCA 201,
14 "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design,"
15 Sections 5 and 6. Compare this data with the design data and installed conditions.

16 Examine system and equipment installations to verify that they are complete and that testing,
17 cleaning, adjusting, and commissioning specified in individual Sections have been performed.

18 Examine system and equipment test reports.

19 Examine HVAC system and equipment installations to verify that indicated balancing devices,
20 such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and
21 fittings, and manual volume dampers, are properly installed, and that their locations are
22 accessible and appropriate for effective balancing and for efficient system and equipment
23 operation.

24 Examine systems for functional deficiencies that cannot be corrected by adjusting and
25 balancing.

26 Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased,
27 belts are aligned and tight, and equipment with functioning controls is ready for operation.

28 Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and
29 their controls are connected and functioning.

30 Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe
31 penetrations and other holes are sealed.

32 Examine strainers for clean screens and proper perforations.

33 Examine three-way valves for proper installation for their intended function of diverting or
34 mixing fluid flows.

35 Examine heat-transfer coils for correct piping connections and for clean and straight fins.

36 Examine system pumps to ensure absence of entrained air in the suction piping.

37 Examine equipment for installation and for properly operating safety interlocks and controls.

38 Examine Coordinate with Controls Contractor and Commissioning Agent to confirm the
39 following automatic temperature system components to verify the following have been verified:

40 Dampers, valves, and other controlled devices are operated by the intended controller.

41 Dampers and valves are in the position indicated by the controller.

42 Integrity of valves and dampers for free and full operation and for tightness of fully
43 closed and fully open positions. This includes dampers in multizone air handling units,
44 mixing boxes, and variable-air-volume terminals.

45 Automatic modulating and shutoff valves, including two-way valves and three-way
46 mixing and diverting valves, are properly connected.

47 Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and
48 cold walls.

- 1 Sensors are located to sense only the intended conditions.
- 2 Sequence of operation for control modes is according to the Contract Documents.
- 3 Controller set points are set at indicated values.
- 4 Interlocked systems are operating.
- 5 Changeover from heating to cooling mode occurs according to indicated values.
- 6 Report deficiencies discovered before and during performance of TAB procedures. Observe and
- 7 record system reactions to changes in conditions. Record default set points if different from
- 8 indicated values.

9

10 Preparation

11 Prepare a TAB plan that includes strategies and step-by-step procedures, including but not
12 limited to:

- 13 List of preliminary checks to be performed at the job site such as confirmation that
- 14 manual volume dampers are present, filter are installed, frequency drive units
- 15 operational, location of control sensors, etc.
- 16 Identify how air outlets will be measured and type of instruments to be used.
- 17 Locations of pitot traverses and type of instruments to be used.
- 18 Modes of operation that the system will be placed in during balancing and testing,, i.e.,
- 19 full cooling and heating, maximum and minimum outside air flows, toilet fans on or off,
- 20 etc.
- 21 Position of doors and windows during balance, i.e. some labs should be balanced with
- 22 doors shut.
- 23 Operating static pressures for terminal devices and pressure sensors for controlled
- 24 devices.
- 25 Method of adjusting outside and return air quantities at air handling units.
- 26 Initial test procedures for preliminary balance.
- 27 Final test procedures.
- 28 List of deficiencies in mechanical systems that will hinder the balance work such as
- 29 missing leaky dampers, incomplete systems inadequate fans, etc.
- 30 Identification of equipment to be used on project and proof of last calibration on each
- 31 piece.

32 Complete system readiness checks and prepare system readiness reports. Verify the following:

- 33 Permanent electrical power wiring is complete.
- 34 Hydronic systems are filled, clean, and free of air.
- 35 Automatic temperature-control systems are operational.
- 36 Equipment and duct access doors are securely closed.
- 37 Balance, smoke, and fire dampers are open.
- 38 Isolating and balancing valves are open and control valves are operational.
- 39 Ceilings are installed in critical areas where air-pattern adjustments are required and
- 40 access to balancing devices is provided.
- 41 Windows and doors can be closed so indicated conditions for system operations can be
- 42 met.

43

44 General Procedures For Testing And Balancing

45 Perform testing and balancing procedures on each system according to the procedures
46 contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air
47 Conditioning Systems" and this Section.

48 Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

1 Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the
 2 minimum extent necessary to allow adequate performance of procedures. After testing and
 3 balancing, close probe holes and patch insulation with new materials identical to those
 4 removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
 5 Mark equipment and balancing device settings with spray paint or other suitable, permanent
 6 identification material, including damper-control positions, valve position indicators, fan-speed-
 7 control levers, and similar controls and devices, to show final settings.
 8 Take and report testing and balancing measurements in inch-pound (IP) units.

9 10 General Procedures For Balancing Air Systems

11 Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and
 12 recommended testing procedures. Crosscheck the summation of required outlet volumes with
 13 required fan volumes.
 14 Prepare schematic diagrams of systems' "as-built" duct layouts.
 15 For variable-air-volume systems, develop a plan to simulate diversity.
 16 Determine the best locations in main and branch ducts for accurate duct airflow measurements.
 17 Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-
 18 air dampers, through the supply-fan discharge and mixing dampers.
 19 Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 20 Verify that motor starters are equipped with properly sized thermal protection.
 21 Check dampers for proper position to achieve desired airflow path.
 22 Check for airflow blockages.
 23 Check condensate drains for proper connections and functioning.
 24 Check for proper sealing of air-handling unit components.
 25 Check for proper sealing of air duct system.
 26 Filters shall be loaded or restricted to increase pressure drop to 50 percent of span between
 27 initial pressure drop and final recommended pressure drop for setting final airflows for fans.
 28 Airflow rate shall be balanced at room outlets. Totals of airflow rates from outlets shall be
 29 compared to pitot traverses. Identify in writing discrepancies between the two.
 30 Pitot traverses shall be performed for fan total air flows. Locations of pitot traverses shall be
 31 marked on reduced drawings in final report.
 32 Fixed pitch sheaves shall be installed for final speed settings on all fans regardless of size
 33 sheaves and belts shall be compatible. Report discrepancies in writing.

34 35 Procedures For Constant-Volume Air Systems

36 Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by
 37 fan manufacturer.

38 Measure fan static pressures to determine actual static pressure as follows:

39 Measure outlet static pressure as far downstream from the fan as practicable
 40 and upstream from restrictions in ducts such as elbows and transitions.

41 Measure static pressure directly at the fan outlet or through the flexible
 42 connection.

43 Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan
 44 as possible, upstream from flexible connection and downstream from duct
 45 restrictions.

46 Measure inlet static pressure of double-inlet fans through the wall of the
 47 plenum that houses the fan.

- 1 Measure static pressure across each component that makes up air-handling and -
2 treating equipment.
- 3 Simulate dirty filter operation and record the point at which maintenance
4 personnel must change filters.
- 5 Measure static pressures entering and leaving other devices such as sound traps, heat
6 recovery equipment, and air washers, under final balanced conditions.
- 7 Compare design data with installed conditions to determine variations in design static
8 pressures versus actual static pressures. Compare actual system effect factors with
9 calculated system effect factors to identify where variations occur. Recommend
10 corrective action to align design and actual conditions.
- 11 Obtain approval from Architect for adjustment of fan speed higher or lower than
12 indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical
13 connections to accommodate fan-speed changes.
- 14 Do not make fan-speed adjustments that result in motor overload. Consult equipment
15 manufacturers about fan-speed safety factors. Modulate dampers and measure fan-
16 motor amperage to ensure that no overload will occur. Measure amperage in full
17 cooling, full heating, economizer, and any other operating modes to determine the
18 maximum required brake horsepower.
- 19 Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated
20 airflows within specified tolerances.
- 21 Measure static pressure at a point downstream from the balancing damper and adjust
22 volume dampers until the proper static pressure is achieved.
- 23 Where sufficient space in submain and branch ducts is unavailable for Pitot-tube
24 traverse measurements, measure airflow at terminal outlets and inlets and
25 calculate the total airflow for that zone.
- 26 Remeasure each submain and branch duct after all have been adjusted. Continue to
27 adjust submain and branch ducts to indicated airflows within specified tolerances.
- 28 Measure terminal outlets and inlets without making adjustments.
- 29 Measure terminal outlets using a direct-reading hood or outlet manufacturer's written
30 instructions and calculating factors.
- 31 Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances
32 of indicated values. Make adjustments using volume dampers rather than extractors and the
33 dampers at air terminals.
- 34 Adjust each outlet in same room or space to within specified tolerances of indicated
35 quantities without generating noise levels above the limitations prescribed by the
36 Contract Documents.
- 37 Adjust patterns of adjustable outlets for proper distribution without drafts.
- 38
- 39 Procedures For Variable-Air-Volume Systems
- 40 **Compensating for Diversity:** When the total airflow of all terminal units is more than the
41 indicated airflow of the fan, place a selected number of terminal units at a maximum set-point
42 airflow condition until the total airflow of the terminal units equals the indicated airflow of the
43 fan. Select the reduced airflow terminal units so they are distributed evenly among the branch
44 ducts.
- 45 **Pressure-Independent, Variable-Air-Volume Systems:** After the fan systems have been adjusted,
46 adjust the variable-air-volume systems as follows:
- 47 Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position
48 that simulates full-cooling load.

1 Select the terminal unit that is most critical to the supply-fan airflow and static pressure.
 2 Measure static pressure. Adjust system static pressure so the entering static pressure
 3 for the critical terminal unit is not less than the sum of terminal-unit manufacturer's
 4 recommended minimum inlet static pressure plus the static pressure needed to
 5 overcome terminal-unit discharge system losses.

6 Measure total system airflow. Adjust to within indicated airflow.

7 Set terminal units at maximum airflow and adjust controller or regulator to deliver the
 8 designed maximum airflow. Use terminal-unit manufacturer's written instructions to
 9 make this adjustment. When total airflow is correct, balance the air outlets
 10 downstream from terminal units as described for constant-volume air systems.

11 Set terminal units at minimum airflow and adjust controller or regulator to deliver the
 12 designed minimum airflow. Check air outlets for a proportional reduction in airflow as
 13 described for constant-volume air systems.

14 If air outlets are out of balance at minimum airflow, report the condition but
 15 leave outlets balanced for maximum airflow.

16 Remeasure the return airflow to the fan while operating at maximum return airflow and
 17 minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as
 18 described for constant-volume air systems.

19 Measure static pressure at the most critical terminal unit and adjust the static-pressure
 20 controller at the main supply-air sensing station to ensure that adequate static pressure
 21 is maintained at the most critical unit.

22 Record the final fan performance data.

23 VAV boxes shall be balanced for full cooling, full heating and minimum airflows.
 24

25 General Procedures For Hydronic Systems

26 Prepare test reports with pertinent design data and number in sequence starting at pump to
 27 end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct
 28 variations that exceed plus or minus 5 percent.

29 Prepare hydronic systems for testing and balancing according to the following, in addition to the
 30 general preparation procedures specified above:

31 Open all manual valves for maximum flow.

32 Check expansion tank liquid level.

33 Check makeup-water-station pressure gage for adequate pressure for highest vent.

34 Check flow-control valves for specified sequence of operation and set at indicated flow.

35 Set differential-pressure control valves at the specified differential pressure. Do not set
 36 at fully closed position when pump is positive-displacement type unless several terminal
 37 valves are kept open.

38 Set system controls so automatic valves are wide open to heat exchangers.

39 Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so
 40 motor nameplate rating is not exceeded.

41 Check air vents for a forceful liquid flow exiting from vents when manually operated.
 42

43 Procedures For Hydronic Systems

44 Measure water flow at pumps. Use the following procedures, except for positive-displacement
 45 pumps:

46 Verify impeller size by operating the pump with the discharge valve closed. Read
 47 pressure differential across the pump. Convert pressure to head and correct for

1 differences in gage heights. Note the point on manufacturer's pump curve at zero flow
2 and verify that the pump has the intended impeller size.

3 Check system resistance. With all valves open, read pressure differential across the
4 pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge
5 valve until indicated water flow is achieved.

6 Verify pump-motor brake horsepower. Calculate the intended brake horsepower for
7 the system based on pump manufacturer's performance data. Compare calculated
8 brake horsepower with nameplate data on the pump motor. Report conditions where
9 actual amperage exceeds motor nameplate amperage.

10 Report flow rates that are not within plus or minus 5 percent of design.

11 Set calibrated balancing valves, if installed, at calculated presettings.

12 Measure flow at all stations and adjust, where necessary, to obtain first balance.

13 System components that have Cv rating or an accurately cataloged flow-pressure-drop
14 relationship may be used as a flow-indicating device.

15 Measure flow at main balancing station and set main balancing device to achieve flow that is 5
16 percent greater than indicated flow.

17 Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

18 Determine the balancing station with the highest percentage over indicated flow.

19 Adjust each station in turn, beginning with the station with the highest percentage over
20 indicated flow and proceeding to the station with the lowest percentage over indicated
21 flow.

22 Record settings and mark balancing devices.

23 Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump
24 heads, and systems' pressures and temperatures including outdoor-air temperature.

25 Measure the differential-pressure control valve settings existing at the conclusions of balancing.

26 27 Procedures For Variable-Flow Hydronic Systems

28 Balance systems with automatic two- and three-way control valves by setting systems at
29 maximum flow through heat-exchange terminals and proceed as specified above for hydronic
30 systems.

31 32 Procedures For Steam Systems

33 Measure and record upstream and downstream pressure of each piece of equipment.

34 Check the setting and operation of automatic temperature-control valves, self-contained control
35 valves, and pressure-reducing valves. Record the final setting.

36 Check the settings and operation of each safety valve. Record settings.

37 Verify the operation of each steam trap.

38 39 Procedures For Heat Exchangers

40 Measure water flow through all circuits.

41 Adjust water flow to within specified tolerances.

42 Measure inlet and outlet water temperatures.

43 Measure inlet steam pressure.

44 Check the setting and operation of safety and relief valves. Record settings.

45 46 Procedures For Motors

47 Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

48 Manufacturer, model, and serial numbers.

- 1 Motor horsepower rating.
- 2 Motor rpm.
- 3 Efficiency rating.
- 4 Nameplate and measured voltage, each phase.
- 5 Nameplate and measured amperage, each phase.
- 6 Starter thermal-protection-element rating.
- 7 Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying
- 8 from minimum to maximum. Test the manual bypass for the controller to prove proper
- 9 operation. Record observations, including controller manufacturer, model and serial numbers,
- 10 and nameplate data.

11

12 Procedures For Condensing Units

- 13 Verify proper rotation of fans.
- 14 Measure entering- and leaving-air temperatures.
- 15 Record compressor data.

16

17 Procedures For Heat-Transfer Coils

- 18 Water Coils: Measure the following data for each coil:
- 19 Entering- and leaving-water temperature.
- 20 Water flow rate.
- 21 Water pressure drop.
- 22 Dry-bulb temperature of entering and leaving air.
- 23 Wet-bulb temperature of entering and leaving air for cooling coils.
- 24 Airflow.
- 25 Air pressure drop.
- 26 Electric-Heating Coils: Measure the following data for each coil:
- 27 Nameplate data.
- 28 Airflow.
- 29 Entering- and leaving-air temperature at full load.
- 30 Voltage and amperage input of each phase at full load and at each incremental stage.
- 31 Calculated kilowatt at full load.
- 32 Fuse or circuit-breaker rating for overload protection.
- 33 Refrigerant Coils: Measure the following data for each coil:
- 34 Dry-bulb temperature of entering and leaving air.
- 35 Wet-bulb temperature of entering and leaving air.
- 36 Airflow.
- 37 Air pressure drop.
- 38 Refrigerant suction pressure and temperature.

39

40 Procedures For Temperature Measurements

- 41 During TAB, report the need for adjustment in temperature regulation within the automatic
- 42 temperature-control system.
- 43 Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive
- 44 eight-hour days, in each separately controlled zone, to prove correctness of final temperature
- 45 settings. Measure when the building or zone is occupied.
- 46 Measure outside-air, wet- and dry-bulb temperatures.

Procedures For Space Pressurization Measurements And Adjustments

Before testing for space pressurization, observe the space to verify the integrity of the space boundaries. Verify that windows and doors are closed and applicable safing, gaskets, and sealants are installed. Report deficiencies and postpone testing until after the reported deficiencies are corrected.

Measure, adjust, and record the pressurization building by adjusting the supply, return, and exhaust airflows to achieve the indicated conditions.

Measure space pressure differential where pressure is used as the design criteria, and measure airflow differential where differential airflow is used as the design criteria for space pressurization.

For pressure measurements, measure and record the pressure difference between the intended spaces at the door with all doors in the space closed. Record the high-pressure side, low-pressure side, and pressure difference between each adjacent space.

To achieve indicated pressurization, set the supply airflow to the indicated conditions and adjust the exhaust and return airflow to achieve the indicated pressure or airflow difference.

Record indicated conditions and corresponding initial and final measurements. Report deficiencies.

Procedures For Vibration Measurements

CSU vibration criteria to be verified by Owner's Representative contracted through the Owner.

Temperature-Control Verification

Confirm that the Control Contractor has completed the following:

Verify that controllers are calibrated and commissioned.

Check transmitter and controller locations and note conditions that would adversely affect control functions.

Record controller settings and note variances between set points and actual measurements.

Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

Check free travel and proper operation of control devices such as damper and valve operators.

Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

Check the interaction of electrically operated switch transducers.

Check the interaction of interlock and lockout systems.

Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.

Note operation of electric actuators using spring return for proper fail-safe operations.

Tolerances

Set HVAC system airflow and water flow rates within the following tolerances:

Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.

Air Outlets and Inlets: Plus or minus 5 percent.

Heating-Water Flow Rate: Plus or minus 5 percent.

Cooling-Water Flow Rate: Plus or minus 5 percent.

Reporting

Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

Final Report

General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

Include a list of instruments used for procedures, along with proof of calibration.

Final Report Contents: In addition to certified field report data, include the following:

Pump curves.

Fan curves.

Manufacturers' test data.

Field test reports prepared by system and equipment installers.

Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

Title page.

Name and address of TAB firm.

Project name.

Project location.

Architect's name and address.

Engineer's name and address.

Contractor's name and address.

Report date.

Signature of TAB firm who certifies the report.

Table of Contents with the total number of pages defined for each section of the report.

Number each page in the report.

Summary of contents including the following:

Indicated versus final performance.

Notable characteristics of systems.

Description of system operation sequence if it varies from the Contract Documents.

Nomenclature sheets for each item of equipment.

Data for terminal units, including manufacturer, type size, and fittings.

Notes to explain why certain final data in the body of reports varies from indicated values.

Test conditions for fans and pump performance forms including the following:

- 1 Settings for outside-, return-, and exhaust-air dampers.
 2 Conditions of filters.
 3 Cooling coil, wet- and dry-bulb conditions.
 4 Face and bypass damper settings at coils.
 5 Fan drive settings including settings and percentage of maximum pitch
 6 diameter.
 7 Variable Frequency Drive settings for variable-air-volume systems.
 8 Settings for supply-air, static-pressure controller.
 9 Other system operating conditions that affect performance.
- 10 **System Diagrams:** Include schematic layouts of air and hydronic distribution systems. Present
 11 each system with single-line diagram and include the following:
 12 Quantities of outside, supply, return, and exhaust airflows.
 13 Water and steam flow rates.
 14 Duct, outlet, and inlet sizes.
 15 Pipe and valve sizes and locations.
 16 Terminal units.
 17 Balancing stations.
 18 Position of balancing devices.
- 19 **Air-Handling Unit Test Reports:** For air-handling units with coils, include the following:
 20 **Unit Data:** Include the following:
 21 Unit identification.
 22 Location.
 23 Make and type.
 24 Model number and unit size.
 25 Manufacturer's serial number.
 26 Unit arrangement and class.
 27 Discharge arrangement.
 28 Sheave make, size in inches, and bore.
 29 Sheave dimensions, center-to-center, and amount of adjustments in inches.
 30 Number of belts, make, and size.
 31 Number of filters, type, and size.
- 32 **Motor Data:**
 33 Make and frame type and size.
 34 Horsepower and rpm.
 35 Volts, phase, and hertz.
 36 Full-load amperage and service factor.
 37 Sheave make, size in inches, and bore.
 38 Sheave dimensions, center-to-center, and amount of adjustments in inches.
- 39 **Test Data (Indicated and Actual Values):**
 40 Total airflow rate in cfm.
 41 Total system static pressure in inches wg.
 42 Fan rpm.
 43 Discharge static pressure in inches wg.
 44 Filter static-pressure differential in inches wg.
 45 Preheat coil static-pressure differential in inches wg.
 46 Cooling coil static-pressure differential in inches wg.
 47 Heating Indirect Cooling coil static-pressure differential in inches wg.
 48 Outside airflow in cfm.

- 1 Return airflow in cfm.
- 2 Outside-air damper position.
- 3 Return-air damper position.
- 4 Apparatus-Coil Test Reports:
- 5 Coil Data:
- 6 System identification.
- 7 Location.
- 8 Coil type.
- 9 Number of rows.
- 10 Fin spacing in fins per incho.c.
- 11 Make and model number.
- 12 Face area in sq. ft..
- 13 Tube size in NPS.
- 14 Tube and fin materials.
- 15 Circuiting arrangement.
- 16 Test Data (Indicated and Actual Values):
- 17 Airflow rate in cfm.
- 18 Average face velocity in fpm.
- 19 Air pressure drop in inches wg.
- 20 Outside-air, wet- and dry-bulb temperatures in deg F.
- 21 Return-air, wet- and dry-bulb temperatures in deg F.
- 22 Entering-air, wet- and dry-bulb temperatures in deg F.
- 23 Leaving-air, wet- and dry-bulb temperatures in deg F.
- 24 Water flow rate in gpm.
- 25 Water pressure differential in feet of head or psig.
- 26 Entering-water temperature in deg F.
- 27 Leaving-water temperature in deg F.
- 28 Refrigerant expansion valve and refrigerant types.
- 29 Refrigerant suction pressure in psig.
- 30 Refrigerant suction temperature in deg F.
- 31 Fan Test Reports: For supply, return, and exhaust fans, include the following:
- 32 Fan Data:
- 33 System identification.
- 34 Location.
- 35 Make and type.
- 36 Model number and size.
- 37 Manufacturer's serial number.
- 38 Arrangement and class.
- 39 Sheave make, size in inches, and bore.
- 40 Sheave dimensions, center-to-center, and amount of adjustments in inches.
- 41 Motor Data:
- 42 Make and frame type and size.
- 43 Horsepower and rpm.
- 44 Volts, phase, and hertz.
- 45 Full-load amperage and service factor.
- 46 Sheave make, size in inches, and bore.
- 47 Sheave dimensions, center-to-center, and amount of adjustments in inches.
- 48 Number of belts, make, and size.

- 1 **Test Data (Indicated and Actual Values):**
- 2 Total airflow rate in cfm.
- 3 Total system static pressure in inches wg.
- 4 Fan rpm.
- 5 Discharge static pressure in inches wg.
- 6 Suction static pressure in inches wg.
- 7 **Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the**
- 8 **duct cross-section and record the following:**
- 9 **Report Data:**
- 10 System and air-handling unit number.
- 11 Location and zone.
- 12 Traverse air temperature in deg F.
- 13 Duct static pressure in inches wg.
- 14 Duct size in inches.
- 15 Duct area in sq. ft..
- 16 Indicated airflow rate in cfm.
- 17 Indicated velocity in fpm.
- 18 Actual airflow rate in cfm.
- 19 Actual average velocity in fpm.
- 20 Barometric pressure in psig.
- 21 **Air-Terminal-Device Reports:**
- 22 **Unit Data:**
- 23 System and air-handling unit identification.
- 24 Location and zone.
- 25 Test apparatus used.
- 26 Area served.
- 27 Air-terminal-device make.
- 28 Air-terminal-device number from system diagram.
- 29 Air-terminal-device type and model number.
- 30 Air-terminal-device size.
- 31 Air-terminal-device effective area in sq. ft..
- 32 **Test Data (Indicated and Actual Values):**
- 33 Airflow rate in cfm.
- 34 Air velocity in fpm.
- 35 Preliminary airflow rate as needed in cfm.
- 36 Preliminary velocity as needed in fpm.
- 37 Final airflow rate in cfm.
- 38 Final velocity in fpm.
- 39 Space temperature in deg F.
- 40 **System-Coil Reports: For reheat coils and water coils of terminal units, include the following:**
- 41 **Unit Data:**
- 42 System and air-handling unit identification.
- 43 Location and zone.
- 44 Room or riser served.
- 45 Coil make and size.
- 46 Flowmeter type.
- 47 **Test Data (Indicated and Actual Values):**
- 48 Airflow rate in cfm.

- 1 Entering-water temperature in deg F.
 2 Leaving-water temperature in deg F.
 3 Water pressure drop in feet of head or psig.
 4 Entering-air temperature in deg F.
 5 Leaving-air temperature in deg F.
- 6 Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone
 7 refrigerant compressors, air-cooled condensing units include the following:
- 8 Unit Data:
 9 Unit identification.
 10 Location.
 11 Unit make and model number.
 12 Compressor make.
 13 Compressor model and serial numbers.
 14 Refrigerant weight in lb.
 15 Low ambient temperature cutoff in deg F.
- 16 Test Data (Indicated and Actual Values):
 17 Entering-air, dry-bulb temperature in deg F.
 18 Leaving-air, dry-bulb temperature in deg F.
 19 Control settings.
 20 Unloader set points.
 21 Low-pressure-cutout set point in psig.
 22 High-pressure-cutout set point in psig.
 23 Suction pressure in psig.
 24 Suction temperature in deg F.
 25 Condenser refrigerant pressure in psig.
 26 Condenser refrigerant temperature in deg F.
 27 Oil pressure in psig.
 28 Oil temperature in deg F.
 29 Voltage at each connection.
 30 Amperage for each phase.
 31 Kilowatt input.
 32 Crankcase heater kilowatt.
 33 Number of fans.
 34 Condenser fan rpm.
 35 Condenser fan airflow rate in cfm.
 36 Condenser fan motor make, frame size, rpm, and horsepower.
 37 Condenser fan motor voltage at each connection.
 38 Condenser fan motor amperage for each phase.
- 39 Heat-Exchanger/Converter Test Reports: For steam and, hot-water and chilled water,
 40 heat exchangers, include the following:
- 41 Unit Data:
 42 Unit identification.
 43 Location.
 44 Service.
 45 Make and type.
 46 Model and serial numbers.
 47 Ratings.
- 48 Steam Test Data (Indicated and Actual Values):

- 1 Inlet pressure in psig.
- 2 Condensate flow rate in lb/h.
- 3 Primary Water Test Data (Indicated and Actual Values):
- 4 Entering-water temperature in deg F.
- 5 Leaving-water temperature in deg F.
- 6 Entering-water pressure in feet of head or psig.
- 7 Water pressure differential in feet of head or psig.
- 8 Water flow rate in gpm.
- 9 Secondary Water Test Data (Indicated and Actual Values):
- 10 Entering-water temperature in deg F.
- 11 Leaving-water temperature in deg F.
- 12 Entering-water pressure in feet of head or psig.
- 13 Water pressure differential in feet of head or psig.
- 14 Water flow rate in gpm.
- 15 Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and
- 16 include the following:
- 17 Unit Data:
- 18 Unit identification.
- 19 Location.
- 20 Service.
- 21 Make and size.
- 22 Model and serial numbers.
- 23 Water flow rate in gpm.
- 24 Water pressure differential in feet of head or psig.
- 25 Required net positive suction head in feet of head or psig.
- 26 Pump rpm.
- 27 Impeller diameter in inches.
- 28 Motor make and frame size.
- 29 Motor horsepower and rpm.
- 30 Voltage at each connection.
- 31 Amperage for each phase.
- 32 Full-load amperage and service factor.
- 33 Seal type.
- 34 Test Data (Indicated and Actual Values):
- 35 Static head in feet of head or psig.
- 36 Pump shutoff pressure in feet of head or psig.
- 37 Actual impeller size in inches.
- 38 Full-open flow rate in gpm.
- 39 Full-open pressure in feet of head or psig.
- 40 Final discharge pressure in feet of head or psig.
- 41 Final suction pressure in feet of head or psig.
- 42 Final total pressure in feet of head or psig.
- 43 Final water flow rate in gpm.
- 44 Voltage at each connection.
- 45 Amperage for each phase.
- 46 Instrument Calibration Reports:
- 47 Report Data:
- 48 Instrument type and make.

1 Serial number.
2 Application.
3 Dates of use.
4 Dates of calibration.
5

6 Inspections

7 Initial Inspection:

8 After testing and balancing are complete, operate each system and randomly check
9 measurements to verify that the system is operating according to the final test and
10 balance readings documented in the Final Report.

11 Randomly check the following for each system:

12 Measure airflow of at least 10 percent of air outlets.

13 Measure water flow of at least 5 percent of terminals.

14 Measure room temperature at each thermostat/temperature sensor. Compare
15 the reading to the set point.

16 Measure space pressure of at least 10 percent of locations.

17 Verify that balancing devices are marked with final balance position.

18 Note deviations to the Contract Documents in the Final Report.

19 Final Inspection:

20 After initial inspection is complete and evidence by random checks verifies that testing
21 and balancing are complete and accurately documented in the final report, request that
22 a final inspection be made by Architect.

23 TAB firm test and balance engineer shall conduct the inspection in the presence of
24 Commissioning Agent.

25 Commissioning Agent shall randomly select measurements documented in the final
26 report to be rechecked.

27 If the rechecks yield measurements that differ from the measurements documented in
28 the final report by more than the tolerances allowed, the measurements shall be noted
29 as "FAILED."

30 If the number of "FAILED" measurements is greater than 10 percent of the total
31 measurements checked during the final inspection, the testing and balancing shall be
32 considered incomplete and shall be rejected.

33 TAB firm shall recheck all measurements and make adjustments. Revise the final report
34 and balancing device settings to include all changes and resubmit the final report.

35 Request a second final inspection. If the second final inspection also fails, Owner shall
36 contract the services of another TAB firm to complete the testing and balancing in
37 accordance with the Contract Documents and deduct the cost of the services from the
38 final payment.
39

40 Additional Tests

41 Within 90 days of completing TAB, perform additional testing and balancing to verify that
42 balanced conditions are being maintained throughout and to correct unusual conditions.

43 Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and
44 winter conditions, perform additional testing, inspecting, and adjusting during near-peak
45 summer and winter conditions.
46

47 END OF SECTION

1 SECTION 23 0700 - HVAC INSULATION

2
3 GENERAL

4
5 Summary

6 This Section includes mechanical insulation for boiler breeching, duct, equipment, and pipe,
7 including the following:

8 Insulation Materials:

9 Calcium silicate.

10 Cellular Glass

11 Flexible elastomeric.

12 Mineral fiber.

13 Adhesives.

14 Mastics.

15 Lagging adhesives.

16 Sealants.

17 Factory-applied jackets.

18 Field-applied jackets.

19 Tapes.

20 Securements.

21 Corner angles.

22
23 Definitions

24 ASJ: All-service jacket.

25 FSK: Foil, scrim, kraft paper.

26 FSP: Foil, scrim, polyethylene.

27 PVDC: Polyvinylidene chloride.

28 SSL: Self-sealing lap.

29
30 Submittals

31 Product Data: For each type of product indicated, identify thermal conductivity,
32 thickness, and jackets (both factory and field applied, if any), and flame spread and
33 smoke developed indices.

34
35 Coordination

36 Coordinate size and location of supports, hangers, and insulation shields specified in
37 Division 23 Section "Hangers and Supports."

38 Coordinate clearance requirements with piping Installer for piping insulation application
39 duct Installer for duct insulation application, and equipment Installer for equipment
40 insulation application. Before preparing piping and ductwork Shop Drawings, establish
41 and maintain clearance requirements for installation of insulation and field-applied
42 jackets and finishes and for space required for maintenance.

43
44 Scheduling

45 Schedule insulation application after pressure testing systems and, where required,
46 after installing and testing heat tracing. Insulation application may begin on segments
47 that have satisfactory test results.

1 PRODUCTS

2
3 Manufacturers

4 In other Part 2 articles where titles below introduce lists, the following requirements
5 apply to product selection:

6 Products: Subject to compliance with requirements, provide one of the products
7 specified.

8 Manufacturers: Subject to compliance with requirements, provide products by one of
9 the manufacturers specified.

10
11 Insulation Materials

12 Refer to Part 3 schedule articles for requirements about where insulating materials shall
13 be applied.

14 Products shall not contain asbestos, lead, mercury, or mercury compounds.

15 Products that come in contact with stainless steel shall have a leachable chloride
16 content of less than 50 ppm when tested according to ASTM C 871.

17 Calcium Silicate:

18 Products:

19 Industrial Insulation Group (The); Thermo-12 Gold.

20 Preformed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible,
21 inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply
22 with ASTM C 533, Type I.

23 Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous
24 calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533,
25 Type I.

26 Prefabricated Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions
27 used in preforming insulation to cover valves, elbows, tees, and flanges.

28 Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid,
29 hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-
30 Applied Jackets" Article.

31 Products: Subject to compliance with requirements, provide the following:

32 Pittsburgh Corning Corporation; Foamglas Super K.

33 Block Insulation: ASTM C 552, Type I.

34 Special-Shaped Insulation: ASTM C 552, Type III.

35 Board Insulation: ASTM C 552, Type IV

36 Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.

37 Preformed Pipe Insulation with Factory-Applied [ASJ] [ASJ-SSL]: Comply with

38 ASTM C 552, Type II, Class 2.

39 Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

40 Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with
41 ASTM C 534, Type I for tubular materials and Type II for sheet materials.

42 Products:

43 Aeroflex USA Inc.; Aerocel.

44 Armacell LLC; AP Armaflex.

45 RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

46 Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting
47 resin. Comply with ASTM C 553, Type II and ASTM C 1290. Factory-applied jacket
48 requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1 Products:

2 CertainTeed Corp.; Duct Wrap.
 3 Johns Manville; Microlite.
 4 Knauf Insulation; Duct Wrap.
 5 Manson Insulation Inc.; Alley Wrap.
 6 Owens Corning; All-Service Duct Wrap.

7 Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting
 8 resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications,
 9 provide insulation with factory-applied FSK jacket. For equipment applications, provide
 10 insulation without factory-applied jacket. Factory-applied jacket requirements are
 11 specified in Part 2 "Factory-Applied Jackets" Article.

12 Products:

13 CertainTeed Corp.; Commercial Board.
 14 Fibrex Insulations Inc.; FBX.
 15 Johns Manville; 800 Series Spin-Glas.
 16 Knauf Insulation; Insulation Board.
 17 Manson Insulation Inc.; AK Board.
 18 Owens Corning; Fiberglas 700 Series.

19 High-Temperature, Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with
 20 a thermosetting resin. Comply with ASTM C 612, Type III, without factory-applied
 21 jacket.

22 Products:

23 Fibrex Insulations Inc.; FBX.
 24 Johns Manville; 1000 Series Spin-Glas.
 25 Owens Corning; High Temperature Industrial Board Insulations.
 26 Rock Wool Manufacturing Company; Delta Board.
 27 Roxul Inc.; Roxul RW.
 28 Thermafiber; Thermafiber Industrial Felt.

29 Mineral-Fiber, Preformed Pipe Insulation:

30 Products:

31 Johns Manville; Micro-Lok.
 32 Knauf Insulation; 1000(Pipe Insulation.
 33 Manson Insulation Inc.; Alley-K.
 34 Owens Corning; Fiberglas Pipe Insulation.

35 Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin.
 36 Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied
 37 jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

38 Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a
 39 thermosetting resin. Semirigid board material with factory-applied ASJ complying with
 40 ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612,
 41 Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100
 42 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are
 43 specified in Part 2 "Factory-Applied Jackets" Article.

44 Products:

45 CertainTeed Corp.; CrimpWrap.
 46 Johns Manville; MicroFlex.
 47 Knauf Insulation; Pipe and Tank Insulation.
 48 Manson Insulation Inc.; AK Flex.

Owens Corning; Fiberglas Pipe and Tank Insulation.

Granular Direct Buried Pipe Insulation: Engineered inorganic non-toxic, non-flammable, sodium potassium aluminum silicate insulation with calcium carbonate filler. The insulation shall be chemically treated to render it hydrophobic. The insulation shall be have a thermal conductivity (K-value) of no more than 0.60 Btu/hr/sq. ft./Deg F/in. at a density of 40 lb/cu ft at a mean temperature of 175° F and 0.65 Btu/hr/sq. ft./Deg F/in. at a mean temperature of 300° F. Protective coating requirements are specified in Part 2 "Protective Coatings" article.

Products:

Gilsulate 500XR

Adhesives

Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.

Products:

Childers Products, Division of ITW; CP-97.

Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.

Marathon Industries, Inc.; 290.

Mon-Eco Industries, Inc.; 22-30.

Vimasco Corporation; 760.

For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

Products:

Aeroflex USA Inc.; Aero seal.

Armacell LCC; 520 Adhesive.

Foster Products Corporation, H. B. Fuller Company; 85-75.

RBX Corporation; Rubatex Contact Adhesive.

For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

Products:

Childers Products, Division of ITW; CP-82.

Foster Products Corporation, H. B. Fuller Company; 85-20.

ITW TACC, Division of Illinois Tool Works; S-90/80.

Marathon Industries, Inc.; 225.

Mon-Eco Industries, Inc.; 22-25.

For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

Products:

Childers Products, Division of ITW; CP-82.

Foster Products Corporation, H. B. Fuller Company; 85-20.

ITW TACC, Division of Illinois Tool Works; S-90/80.

Marathon Industries, Inc.; 225.

1 Mon-Eco Industries, Inc.; 22-25.

2 For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated
3 according to 40 CFR 59, Subpart D (EPA Method 24).

4 PVC Jacket Adhesive: Compatible with PVC jacket.

5 Products:

6 Dow Chemical Company (The); 739, Dow Silicone.

7 Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.

8 P.I.C. Plastics, Inc.; Welding Adhesive.

9 Red Devil, Inc.; Celulon Ultra Clear.

10 Speedline Corporation; Speedline Vinyl Adhesive.

11
12 For indoor applications, use adhesive that has a VOC content of 80 g/L or less
13 when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

14 Mastics

15 Materials shall be compatible with insulation materials, jackets, and substrates; comply
16 with MIL-C-19565C, Type II.

17 Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below
18 ambient services.

19 Products:

20 Childers Products, Division of ITW; CP-35.

21 Foster Products Corporation, H. B. Fuller Company; 30-90.

22 ITW TACC, Division of Illinois Tool Works; CB-50.

23 Marathon Industries, Inc.; 590.

24 Mon-Eco Industries, Inc.; 55-40.

25 Vimasco Corporation; 749.

26 Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film
27 thickness.

28 Service Temperature Range: Minus 20 to plus 180 deg F.

29 Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.

30 Color: White.

31 Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient
32 services.

33 Products:

34 Childers Products, Division of ITW; CP-10.

35 Foster Products Corporation, H. B. Fuller Company; 35-00.

36 ITW TACC, Division of Illinois Tool Works; CB-05/15.

37 Marathon Industries, Inc.; 550.

38 Mon-Eco Industries, Inc.; 55-50.

39 Vimasco Corporation; WC-1/WC-5.

40 Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.

41 Service Temperature Range: Minus 20 to plus 200 deg F.

42 Solids Content: 63 percent by volume and 73 percent by weight.

43 Color: White.

44 Lagging Adhesives

45 Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with
46 insulation materials, jackets, and substrates.

1 Products:

2 Childers Products, Division of ITW; CP-52.
 3 Foster Products Corporation, H. B. Fuller Company; 81-42.
 4 Marathon Industries, Inc.; 130.
 5 Mon-Eco Industries, Inc.; 11-30.
 6 Vimasco Corporation; 136.

7 Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-
 8 resistant lagging cloths over duct, equipment, and pipe insulation.
 9 Service Temperature Range: Minus 50 to plus 180 deg F.
 10 Color: White.

11
 12 Sealants

13 FSK and Metal Jacket Flashing Sealants:

14 Products:

15 Childers Products, Division of ITW; CP-76-8.
 16 Foster Products Corporation, H. B. Fuller Company; 95-44.
 17 Marathon Industries, Inc.; 405.
 18 Mon-Eco Industries, Inc.; 44-05.
 19 Vimasco Corporation; 750.

20 Materials shall be compatible with insulation materials, jackets, and substrates.
 21 Fire- and water-resistant, flexible, elastomeric sealant.
 22 Service Temperature Range: Minus 40 to plus 250 deg F.
 23 Color: Aluminum.

24 ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

25 Products:

26 Childers Products, Division of ITW; CP-76.

27 Materials shall be compatible with insulation materials, jackets, and substrates.
 28 Fire- and water-resistant, flexible, elastomeric sealant.
 29 Service Temperature Range: Minus 40 to plus 250 deg F.
 30 Color: White.

31
 32 For indoor applications, use sealants that have a VOC content of 250 g/L or less when
 33 calculated according to 40 CFR 59, Subpart D (EPA Method 24).

34
 35 Factory-Applied Jackets

36 Insulation system schedules indicate factory-applied jackets on various applications.
 37 When factory-applied jackets are indicated, comply with the following:
 38 ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing;
 39 complying with ASTM C 1136, Type I.
 40 ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a
 41 removable protective strip; complying with ASTM C 1136, Type I.
 42 FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing;
 43 complying with ASTM C 1136, Type II.
 44 FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing;
 45 complying with ASTM C 1136, Type II.
 46 PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier
 47 film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a

1 flame-spread index of 5 and a smoke-developed index of 20 when tested according to
 2 ASTM E 84.

3
 4 Field-Applied Jackets

5 Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

6 FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

7 PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784,
 8 Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and
 9 forming. Thickness is indicated in field-applied jacket schedules.

10 Products:

11 Johns Manville; Zeston.

12 P.I.C. Plastics, Inc.; FG Series.

13 Proto PVC Corporation; LoSmoke.

14 Speedline Corporation; SmokeSafe.

15 Adhesive: As recommended by jacket material manufacturer.

16 Color: White.

17 Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

18 Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges,
 19 unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap
 20 and supply covers for lavatories.

21 Factory-fabricated tank heads and tank side panels.

22 Metal Jacket:

23 Products:

24 Childers Products, Division of ITW; Metal Jacketing Systems.

25 PABCO Metals Corporation; Surefit.

26 RPR Products, Inc.; Insul-Mate.

27 Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-
 28 14.

29 Factory cut and rolled to size.

30 Finish and thickness are indicated in field-applied jacket schedules.

31 Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene
 32 and kraft paper.

33 Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded
 34 polyethylene and kraft paper.

35 Factory-Fabricated Fitting Covers:

36 Same material, finish, and thickness as jacket.

37 Preformed 2-piece or gore, 45- and 90-degree, short- and long-
 38 radius elbows.

39 Tee covers.

40 Flange and union covers.

41 End caps.

42 Beveled collars.

43 Valve covers.

44 Field fabricate fitting covers only if factory-fabricated fitting
 45 covers are not available.

46 PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier
 47 film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a

1 flame-spread index of 5 and a smoke-developed index of 20 when tested according to
2 ASTM E 84.

3 Products:

4 Dow Chemical Company (The), Saran 540 Vapor Retarder Film.

5 PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based
6 adhesive covered by a removable protective strip.

8 Tapes

9 ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic
10 adhesive, complying with ASTM C 1136 and UL listed.

11 Products:

12 Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.

13 Compac Corp.; 104 and 105.

14 Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.

15 Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

16 Width: 3 inches.

17 Thickness: 11.5 mils.

18 Adhesion: 90 ounces force/inch in width.

19 Elongation: 2 percent.

20 Tensile Strength: 40 lbf/inch in width.

21 ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

22 FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic
23 adhesive; complying with ASTM C 1136 and UL listed.

24 Products:

25 Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.

26 Compac Corp.; 110 and 111.

27 Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.

28 Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

29 Width: 3 inches.

30 Thickness: 6.5 mils.

31 Adhesion: 90 ounces force/inch in width.

32 Elongation: 2 percent.

33 Tensile Strength: 40 lbf/inch in width.

34 FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

35 PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic
36 adhesive. Suitable for indoor and outdoor applications.

37 Products:

38 Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.

39 Compac Corp.; 130.

40 Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.

41 Venture Tape; 1506 CW NS.

42 Width: 2 inches.

43 Thickness: 6 mils.

44 Adhesion: 64 ounces force/inch in width.

45 Elongation: 500 percent.

46 Tensile Strength: 18 lbf/inch in width.

47 Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

48 Products:

1 Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 2 Compac Corp.; 120.
 3 Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
 4 Venture Tape; 3520 CW.
 5 Width: 2 inches.
 6 Thickness: 3.7 mils.
 7 Adhesion: 100 ounces force/inch in width.
 8 Elongation: 5 percent.
 9 Tensile Strength: 34 lbf/inch in width.
 10 PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic
 11 adhesive.
 12 Products:
 13 Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.
 14 Width: 3 inches.
 15 Film Thickness: 4 mils.
 16 Adhesive Thickness: 1.5 mils.
 17 Elongation at Break: 145 percent.
 18 Tensile Strength: 55 lbf/inch in width.
 19

20 Securements

21 Bands:
 22 Products:
 23 Childers Products; Bands.
 24 PABCO Metals Corporation; Bands.
 25 RPR Products, Inc.; Bands.
 26 Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch
 27 thick, 1/2 inch wide with wing seal.
 28 Insulation Pins and Hangers:
 29 Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for
 30 capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of
 31 insulation indicated.
 32 Products:
 33 AGM Industries, Inc.; CWP-1.
 34 GEMCO; CD.
 35 Midwest Fasteners, Inc.; CD.
 36 Nelson Stud Welding; TPA, TPC, and TPS.
 37 Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully
 38 annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit
 39 depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 40 Products:
 41 AGM Industries, Inc.; CWP-1.
 42 GEMCO; Cupped Head Weld Pin.
 43 Midwest Fasteners, Inc.; Cupped Head.
 44 Nelson Stud Welding; CHP.
 45 Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or
 46 Monel.

Corner Angles

PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

Protective Coatings

Underground Direct Buried Pipe Coating: Bitumastic self-priming, heavy duty, cold applied, water proof coating made from pitch derived from tar and solvents.

Products:

Carboline "Bitumastic Super Service Black".

EXECUTIONExamination

Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

Verify that systems and equipment to be insulated have been tested and are free of defects.

Verify that surfaces to be insulated are clean and dry.

Proceed with installation only after unsatisfactory conditions have been corrected.

Preparation

Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

Common Installation Requirements

Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

Install accessories compatible with insulation materials and suitable for the service.

Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

Install insulation with longitudinal seams at top and bottom of horizontal runs.

Install multiple layers of insulation with longitudinal and end seams staggered.

Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

Keep insulation materials dry during application and finishing.

- 1 Install insulation with tight longitudinal seams and end joints. Bond seams and joints
2 with adhesive recommended by insulation material manufacturer.
3 Install insulation with least number of joints practical.
4 Where vapor barrier is indicated, seal joints, and seams with vapor-barrier mastic.
5 Install insulation continuously through hangers and anchor attachments.
6 For insulation application where vapor barriers are indicated, extend insulation on
7 anchor legs from point of attachment to supported item to point of attachment to
8 structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
9 Install insert materials and install insulation to tightly join the insert. Seal insulation to
10 insulation inserts with adhesive or sealing compound recommended by insulation
11 material manufacturer.
12 Cover inserts with jacket material matching adjacent pipe insulation. Install shields over
13 jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
14 Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate
15 and wet and dry film thicknesses.
16 Install insulation with factory-applied jackets as follows:
17 Draw jacket tight and smooth.
18 Cover circumferential joints with 3-inch-wide strips, of same material as insulation
19 jacket. Secure strips with adhesive and outward clinching staples along both edges of
20 strip, spaced 4 inches o.c.
21 Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with
22 longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
23 Staple laps with outward clinching staples along edge at 2 inches o.c.
24 For below ambient services, apply vapor-barrier mastic over staples.
25 Cover joints and seams with tape as recommended by insulation material manufacturer
26 to maintain vapor seal.
27 Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and
28 at ends adjacent to duct and pipe flanges and fittings.
29 Cut insulation in a manner to avoid compressing insulation more than 75 percent of its
30 nominal thickness.
31 Finish installation with systems at operating conditions. Repair joint separations and
32 cracking due to thermal movement.
33 Repair damaged insulation facings by applying same facing material over damaged
34 areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal
35 patches similar to butt joints.
36 For above ambient services, do not install insulation to the following:
37 Vibration-control devices.
38 Testing agency labels and stamps.
39 Nameplates and data plates.
40 Manholes.
41 Handholes.
42 Cleanouts.
43
44 **Penetrations**
45 Insulation Installation at Roof Penetrations: Install insulation continuously through roof
46 penetrations.
47 Seal penetrations with flashing sealant.

1 For applications requiring only indoor insulation, terminate insulation above roof
 2 surface and seal with joint sealant. For applications requiring indoor and outdoor
 3 insulation, install insulation for outdoor applications tightly joined to indoor insulation
 4 ends. Seal joint with joint sealant.

5 Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of
 6 roof flashing.

7 Seal jacket to roof flashing with flashing sealant.

8 Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation
 9 flush with sleeve seal. Seal terminations with flashing sealant.

10 Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation
 11 continuously through wall penetrations.

12 Seal penetrations with flashing sealant.

13 For applications requiring only indoor insulation, terminate insulation inside wall surface
 14 and seal with joint sealant. For applications requiring indoor and outdoor insulation,
 15 install insulation for outdoor applications tightly joined to indoor insulation ends. Seal
 16 joint with joint sealant.

17 Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at
 18 least 2 inches.

19 Seal jacket to wall flashing with flashing sealant.

20 Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire
 21 Rated): Install insulation continuously through walls and partitions.

22 Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation
 23 continuously through penetrations of fire-rated walls and partitions. Terminate
 24 insulation at fire damper sleeves for fire-rated wall and partition penetrations.

25 Externally insulate damper sleeves to match adjacent insulation and overlap duct
 26 insulation at least 2 inches.

27 Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-
 28 Penetration Firestop Systems."

29 Insulation Installation at Floor Penetrations:

30 Duct: Install insulation continuously through floor penetrations that are
 31 not fire rated. For penetrations through fire-rated assemblies, terminate
 32 insulation at fire damper sleeves and externally insulate damper sleeve
 33 beyond floor to match adjacent duct insulation. Overlap damper sleeve
 34 and duct insulation at least 2 inches.

35 Pipe: Install insulation continuously through floor penetrations.

36 Seal penetrations through fire-rated assemblies according to Division 7 Section
 37 "Through-Penetration Firestop Systems."
 38

39 Duct And Plenum Insulation Installation

40 Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and
 41 insulation pins.

42 Apply adhesives according to manufacturer's recommended coverage rates per unit
 43 area, for 100 percent coverage of duct and plenum surfaces.

44 Apply adhesive to entire circumference of ducts and to all surfaces of fittings and
 45 transitions.

46 Install either capacitor-discharge-weld pins and speed washers or cupped-head,
 47 capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of
 48 vertical ducts as follows:

1 On duct sides with dimensions 18 inches and smaller, place pins along
2 longitudinal centerline of duct. Space 3 inches maximum from insulation end
3 joints, and 16 inches o.c.

4 On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c.
5 each way, and 3 inches maximum from insulation joints. Install additional pins
6 to hold insulation tightly against surface at cross bracing.
7

8 Equipment, Tank, And Vessel Insulation Installation

9 Secure insulation with adhesive and anchor pins and speed washers.

10 Apply adhesives according to manufacturer's recommended coverage rates per unit
11 area, for 100 percent coverage of tank and vessel surfaces.

12 Groove and score insulation materials to fit as closely as possible to equipment,
13 including contours. Bevel insulation edges for cylindrical surfaces for tight joints.
14 Stagger end joints.

15 Protect exposed corners with secured corner angles.

16 Install adhesively attached or self-sticking insulation hangers and speed washers on
17 sides of tanks and vessels as follows:

18 Do not weld anchor pins to ASME-labeled pressure vessels.

19 Select insulation hangers and adhesive that are compatible with service
20 temperature and with substrate.

21 On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation
22 end joints, and 16 inches o.c. in both directions.

23 Do not overcompress insulation during installation.

24 Cut and miter insulation segments to fit curved sides and domed heads of tanks
25 and vessels.

26 Impale insulation over anchor pins and attach speed washers.

27 Cut excess portion of pins extending beyond speed washers or bend parallel
28 with insulation surface. Cover exposed pins and washers with tape matching
29 insulation facing.

30 Secure each layer of insulation with stainless-steel or aluminum bands. Select band
31 material compatible with insulation materials.

32 Where insulation hangers on equipment and vessels are not permitted or practical and
33 where insulation support rings are not provided, install a girdle network for securing
34 insulation. Stretch prestressed aircraft cable around the diameter of vessel and make
35 taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle
36 around equipment approximately 6 inches from each end. Install wire or cable between
37 two circumferential girdles 12 inches o.c. Install a wire ring around each end and
38 around outer periphery of center openings, and stretch prestressed aircraft cable
39 radially from the wire ring to nearest circumferential girdle. Install additional
40 circumferential girdles along the body of equipment or tank at a minimum spacing of 48
41 inches o.c. Use this network for securing insulation with tie wire or bands.

42 Stagger joints between insulation layers at least 3 inches

43 Install insulation in removable segments on equipment access doors, manholes,
44 handholes, and other elements that require frequent removal for service and
45 inspection.

46 Bevel and seal insulation ends around manholes, handholes, ASME stamps, and
47 nameplates.

1 For equipment with surface temperatures below ambient, apply mastic to open ends,
2 joints, seams, breaks, and punctures in insulation.

3 Insulation Installation on Pumps:

4 Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box
5 joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt
6 flanges on 6-inch centers, starting at corners. Install 3/8-inch-diameter fasteners with
7 wing nuts. Alternatively, secure the box sections together using a latching mechanism.
8 Fabricate boxes from galvanized steel, at least .040 inch thick.

9 For below ambient services, install a vapor barrier at seams, joints, and penetrations.
10 Seal between flanges with replaceable gasket material to form a vapor barrier.
11

12 General Pipe Insulation Installation

13 Requirements in this Article generally apply to all insulation materials except where
14 more specific requirements are specified in various pipe insulation material installation
15 articles.

16 Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

17 Install insulation over fittings, valves, strainers, flanges, unions, and other specialties
18 with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

19 Insulate pipe elbows using preformed fitting insulation or mitered fittings made from
20 same material and density as adjacent pipe insulation. Each piece shall be butted tightly
21 against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular
22 surfaces with insulating cement finished to a smooth, hard, and uniform contour that is
23 uniform with adjoining pipe insulation.

24 Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same
25 material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit.
26 Butt each section closely to the next and hold in place with tie wire. Bond pieces with
27 adhesive.

28 Insulate valves using preformed fitting insulation or sectional pipe insulation of same
29 material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe
30 insulation by not less than two times the thickness of pipe insulation, or one pipe
31 diameter, whichever is thicker. For valves, insulate up to and including the bonnets,
32 valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with
33 insulating cement.

34 Insulate strainers using preformed fitting insulation or sectional pipe insulation of same
35 material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe
36 insulation by not less than two times the thickness of pipe insulation, or one pipe
37 diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating
38 cement. Insulate strainers so strainer basket flange or plug can be easily removed and
39 replaced without damaging the insulation and jacket. Provide a removable reusable
40 insulation cover. For below ambient services, provide a design that maintains vapor
41 barrier.

42 Insulate flanges and unions using a section of oversized preformed pipe insulation.
43 Overlap adjoining pipe insulation by not less than two times the thickness of pipe
44 insulation, or one pipe diameter, whichever is thicker.

45 Cover segmented insulated surfaces with a layer of finishing cement and coat with a
46 mastic. Install vapor-barrier mastic for below ambient services and a breather mastic
47 for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel
48 the mastic to a smooth and well-shaped contour.

1 For services not specified to receive a field-applied jacket except for flexible elastomeric
2 install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions.
3 Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using
4 PVC tape.

5 Label the outside insulation jacket of each union with the word "UNION." Match size
6 and color of pipe labels.

7 Insulate instrument connections for thermometers, pressure gages, pressure
8 temperature taps, test connections, flow meters, sensors, switches, and transmitters on
9 insulated pipes, vessels, and equipment. Shape insulation at these connections by
10 tapering it to and around the connection with insulating cement and finish with finishing
11 cement, mastic, and flashing sealant.

12 Install removable insulation covers as necessary. Installation shall conform to the
13 following:

14 Make removable flange and union insulation from sectional pipe insulation of same
15 thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe
16 insulation.

17 When flange and union covers are made from sectional pipe insulation, extend
18 insulation from flanges or union long at least two times the insulation thickness over
19 adjacent pipe insulation on each side of flange or union. Secure flange cover in place
20 with stainless-steel or aluminum bands. Select band material compatible with insulation
21 and jacket.

22 Construct removable valve insulation covers in same manner as for flanges except divide
23 the two-part section on the vertical center line of valve body.

24 When covers are made from block insulation, make two halves, each consisting of
25 mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached
26 insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent
27 pipe insulation on each side of valve. Fill space between flange or union cover and pipe
28 insulation with insulating cement. Finish cover assembly with insulating cement applied
29 in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

30 Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces
31 with a metal jacket.

32 Calcium Silicate Insulation Installation

34 Insulation Installation on Straight Pipes and Tubes:

35 Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten
36 bands without deforming insulation materials.

37 Install 2-layer insulation with joints tightly butted and staggered at least 3 inches.

38 Secure inner layer with wire spaced at 12-inch intervals. Secure outer layer with
39 stainless-steel bands at 12-inch intervals.

40 Apply a skim coat of mineral-fiber, hydraulic-setting cement to insulation surface. When
41 cement is dry, provide aluminum, stucco embossed jacket, 0.016" thick

42 Insulation Installation on Pipe Flanges:

43 Install preformed pipe insulation to outer diameter of pipe flange.

44 Make width of insulation section same as overall width of flange and bolts, plus twice
45 the thickness of pipe insulation.

46 Fill voids between inner circumference of flange insulation and outer circumference of
47 adjacent straight pipe segments with cut sections of block insulation of same material
48 and thickness as pipe insulation.

- 1 Finish flange insulation same as pipe insulation.
2 Insulation Installation on Pipe Fittings and Elbows:
3 Install preformed sections of same material as straight segments of pipe insulation
4 when available. Secure according to manufacturer's written instructions.
5 When preformed insulation sections of insulation are not available, install mitered
6 sections of calcium silicate insulation. Secure insulation materials with wire or bands.
7 Finish fittings insulation same as pipe insulation.
8 Insulation Installation on Valves and Pipe Specialties:
9 Install mitered segments of calcium silicate insulation to valve body. Arrange insulation
10 to permit access to packing and to allow valve operation without disturbing insulation.
11 Install insulation to flanges as specified for flange insulation application.
12 Finish valve and specialty insulation same as pipe insulation.

13
14 Cellular-Glass Insulation Installation

- 15 Insulation Installation on Straight Pipes and Tubes:
16 Secure each layer of insulation to pipe with wire or bands and tighten bands without
17 deforming insulation materials.
18 Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions
19 with vapor-barrier mastic and joint sealant.
20 For insulation with factory-applied jackets on above ambient services, secure laps with
21 outward clinched staples at 6 inches o.c.
22 For insulation with factory-applied jackets on below ambient services, do not staple
23 longitudinal tabs but secure tabs with additional adhesive as recommended by
24 insulation material manufacturer and seal with vapor-barrier mastic and flashing
25 sealant.
26 Insulation Installation on Pipe Flanges:
27 Install preformed pipe insulation to outer diameter of pipe flange.
28 Make width of insulation section same as overall width of flange and bolts, plus twice
29 the thickness of pipe insulation.
30 Fill voids between inner circumference of flange insulation and outer circumference of
31 adjacent straight pipe segments with cut sections of cellular-glass block insulation of
32 same thickness as pipe insulation.
33 Install jacket material with manufacturer's recommended adhesive, overlap seams at
34 least 1 inch , and seal joints with flashing sealant.
35 Insulation Installation on Pipe Fittings and Elbows:
36 Install preformed sections of same material as straight segments of pipe insulation
37 when available. Secure according to manufacturer's written instructions.
38 When preformed sections of insulation are not available, install mitered sections of
39 cellular-glass insulation. Secure insulation materials with wire or bands.
40 Insulation Installation on Valves and Pipe Specialties:
41 Install preformed sections of cellular-glass insulation to valve body.
42 Arrange insulation to permit access to packing and to allow valve operation without
43 disturbing insulation.
44 Install insulation to flanges as specified for flange insulation application.
45

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48

Flexible Elastomeric Insulation Installation

Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

Insulation Installation on Pipe Fittings and Elbows:

Install mitered sections of pipe insulation.

Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

Insulation Installation on Valves and Pipe Specialties:

Install preformed valve covers manufactured of same material as pipe insulation when available.

When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

Install insulation to flanges as specified for flange insulation application.

Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

Mineral-Fiber Insulation Installation

Insulation Installation on Straight Pipes and Tubes:

Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.

For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

Insulation Installation on Pipe Flanges:

Install preformed pipe insulation to outer diameter of pipe flange.

Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

Insulation Installation on Pipe Fittings and Elbows:

Install preformed sections of same material as straight segments of pipe insulation when available.

When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

Insulation Installation on Valves and Pipe Specialties:

Install preformed sections of same material as straight segments of pipe insulation when available.

- 1 When preformed sections are not available, install mitered sections of pipe insulation to
2 valve body.
- 3 Arrange insulation to permit access to packing and to allow valve operation without
4 disturbing insulation.
- 5 Install insulation to flanges as specified for flange insulation application.
- 6 Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and
7 insulation pins.
- 8 Apply adhesives according to manufacturer's recommended coverage rates per unit
9 area, for 100 percent coverage of duct and plenum surfaces.
- 10 Apply adhesive to entire circumference of ducts and to all surfaces of fittings and
11 transitions.
- 12 Install either capacitor-discharge-weld pins and speed washers or cupped-head,
13 capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of
14 vertical ducts as follows:
- 15 On duct sides with dimensions 18 inches and smaller, place pins along
16 longitudinal centerline of duct. Space 3 inches maximum from insulation end
17 joints, and 16 inches o.c.
- 18 On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c.
19 each way and 3 inches maximum from insulation joints. Install additional pins
20 to hold insulation tightly against surface at cross bracing.
- 21 Pins may be omitted from top surface of horizontal, rectangular ducts and
22 plenums.
- 23 Do not overcompress insulation during installation.
- 24 Impale insulation over pins and attach speed washers.
- 25 Cut excess portion of pins extending beyond speed washers or bend parallel
26 with insulation surface. Cover exposed pins and washers with tape matching
27 insulation facing.
- 28 For ducts and plenums with surface temperatures below ambient, install a continuous
29 unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with
30 insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment.
31 Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching
32 staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied
33 jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
- 34 Repair punctures, tears, and penetrations with tape or mastic to maintain
35 vapor-barrier seal.
- 36 Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints.
37 At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
- 38 Install insulation on rectangular duct elbows and transitions with a full insulation section
39 for each surface. Install insulation on round and flat-oval duct elbows with individually
40 mitered gores cut to fit the elbow.
- 41 Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface
42 with 6-inch-wide strips of same material used to insulate duct. Secure on alternating
43 sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- 44 Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation
45 pins.
- 46 Apply adhesives according to manufacturer's recommended coverage rates per unit
47 area, for 100 percent coverage of duct and plenum surfaces.

1 Apply adhesive to entire circumference of ducts and to all surfaces of fittings and
2 transitions.

3 Install either capacitor-discharge-weld pins and speed washers or cupped-head,
4 capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of
5 vertical ducts as follows:

6 On duct sides with dimensions 18 inches and smaller, place pins along
7 longitudinal centerline of duct. Space 3 inches maximum from insulation end
8 joints, and 16 inches o.c.

9 On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c.
10 each way, and 3 inches maximum from insulation joints. Install additional pins
11 to hold insulation tightly against surface at cross bracing.

12 Pins may be omitted from top surface of horizontal, rectangular ducts and
13 plenums.

14 Do not overcompress insulation during installation.

15 Cut excess portion of pins extending beyond speed washers or bend parallel
16 with insulation surface. Cover exposed pins and washers with tape matching
17 insulation facing.

18 For ducts and plenums with surface temperatures below ambient, install a continuous
19 unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with
20 insulation by removing 2 inches (50 mm) from 1 edge and 1 end of insulation segment.
21 Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching
22 staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied
23 jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

24 Repair punctures, tears, and penetrations with tape or mastic to maintain
25 vapor-barrier seal.

26 Install insulation on rectangular duct elbows and transitions with a full insulation section
27 for each surface. Groove and score insulation to fit as closely as possible to outside and
28 inside radius of elbows. Install insulation on round and flat-oval duct elbows with
29 individually mitered gores cut to fit the elbow.

30 Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface
31 with 6-inch-wide strips of same material used to insulate duct. Secure on alternating
32 sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

34 Field-Applied Jacket Installation

35 Where FSK jackets are indicated, install as follows:

36 Draw jacket material smooth and tight.

37 Install lap or joint strips with same material as jacket.

38 Secure jacket to insulation with manufacturer's recommended adhesive.

39 Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at
40 end joints.

41 Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation
42 with vapor-barrier mastic.

43 Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and
44 end joints; for horizontal applications, install with longitudinal seams along top and
45 bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

46 Apply two continuous beads of adhesive to seams and joints, one bead under lap and
47 the finish bead along seam and joint edge.

1 Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and
 2 end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with
 3 weatherproof sealant recommended by insulation manufacturer. Secure jacket with
 4 stainless-steel bands 12 inches o.c. and at end joints.

5 Where PVDC jackets are indicated, install as follows:

6 Apply three separate wraps of filament tape per insulation section to secure pipe
 7 insulation to pipe prior to installation of PVDC jacket.

8 Wrap factory-presizes jackets around individual pipe insulation sections with one end
 9 overlapping the previously installed sheet. Install presized jacket with an approximate
 10 overlap at butt joint of 2 inches over the previous section. Adhere lap seal using
 11 adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around
 12 overlapped butt joint.

13 Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply
 14 adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer
 15 to manufacturer's written instructions for application of adhesives along this spiral edge
 16 to maintain a permanent bond.

17 Jacket can be wrapped in cigarette fashion along length of roll for insulation systems
 18 with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch-circumference
 19 limit allows for 2-inch-overlap seal. Using the length of roll allows for longer sections of
 20 jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal
 21 for "fishmouthing," and use PVDC tape along lap seal to secure joint.

22 Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and
 23 wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

24 Direct Buried Pipe Insulation Installation

25 Trench, anchor, structural supports and pouring of insulation to be per manufacturer's
 26 installation instructions.
 27

28 Finishes

29 Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket
 30 Material: Paint jacket with paint system identified below and as specified in Division 9
 31 painting Sections.

32 Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material
 33 and finish coat paint. Add fungicidal agent to render fabric mildew proof.

34 Finish Coat Material: Interior, flat, latex-emulsion size.

35 Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats
 36 of insulation manufacturer's recommended protective coating.

37 Color: Final color as selected by Architect. Vary first and second coats to allow visual
 38 inspection of the completed Work.

39 Do not field paint aluminum or stainless-steel jackets.
 40

41 Duct Insulation Schedule, General

42 Items Not Insulated:

43 Factory-insulated flexible ducts.

44 Factory-insulated plenums and casings.

45 Flexible connectors.

46 Vibration-control devices.

47 Factory-insulated access panels and doors.
 48

1 Indoor Duct And Plenum Insulation Schedule

2 Supply, return, or exhaust or relief air duct insulation shall be the following:
 3 Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density exterior
 4 wrap.

6 Aboveground, Outdoor Duct And Plenum Insulation Schedule

7 Rectangular, supply or return air duct insulation shall be the following:
 8 Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

10 Equipment Insulation Schedule

11 Insulation materials and thicknesses are identified below. If more than one material is
 12 listed for a type of equipment, selection from materials listed is Contractor's option.
 13 Insulate indoor and outdoor equipment in paragraphs below that is not factory
 14 insulated.

15 Heat-exchanger (water-to-water for cooling service) insulation shall be the following:
 16 Mineral-Fiber Board: 1 inch thick and 2-lb/cu. ft. nominal density.

17 Chilled-water pump insulation shall be the following:

18 Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

19 Heating-hot-water pump insulation shall be the following:

20 Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.

21 Chilled-water expansion/compression tank insulation shall be the following:

22 Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.

23 Heating-hot-water expansion/compression tank insulation shall be the following:

24 Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.

25 Chilled-water air-separator insulation shall be the following:

26 Mineral-Fiber Pipe and Tank: 1 inch thick.

27 Heating-hot-water air-separator insulation shall be the following:

28 Mineral-Fiber Pipe and Tank: 2 inches thick.

30 Piping Insulation Schedule, General

31 Acceptable preformed pipe and tubular insulation materials and thicknesses are
 32 identified for each piping system and pipe size range. If more than one material is listed
 33 for a piping system, selection from materials listed is Contractor's option.

34 Items Not Insulated: Unless otherwise indicated, do not install insulation on the
 35 following:

36 Fire-suppression piping.

37 Below-grade piping.

39 Indoor Piping Insulation Schedule

40 Chilled Water, above 40 Deg F:

41 NPS 12 and Smaller: Insulation shall be the following:

42 Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.

43 Heating-Hot-Water Supply and Return, 200 Deg F and below:

44 NPS 12 and Smaller: Insulation shall be the following:

45 Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

46 Steam and Steam Condensate, 350 Deg F and below:

47 NPS 3/4 and Smaller: Insulation shall be the following:

48 Cellular Glass: 2 inches thick.

1 NPS 1and Larger: Insulation shall be the following:

2 Cellular Glass: 3 inches thick.

3 Refrigerant Suction and Hot-Gas Piping:

4 All Pipe Sizes: Insulation shall be the following:

5 Flexible Elastomeric: 1 inch thick.

6

7 Outdoor, Aboveground Piping Insulation Schedule

8 Refrigerant Suction and Hot-Gas Piping:

9 All Pipe Sizes: Insulation shall be the following:

10 Flexible Elastomeric: 2 inches thick, with UV resistant coating.

11 Chilled Water, above 40 Deg F:

12 NPS 12 and Smaller: Insulation shall be the following:

13 Mineral-Fiber, Preformed Pipe, Type I: 1.5 inch thick.

14

15 Indoor, Field-Applied Jacket Schedule

16 Install jacket over insulation material. For insulation with factory-applied jacket, install
17 the field-applied jacket over the factory-applied jacket.

18 If more than one material is listed, selection from materials listed is Contractor's option.

19 Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

20 PVC: 20 mils thick.

21 Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger

22 Than 72 Inches:

23 Aluminum, Stucco Embossed with 1-1/4-Inch-Deep Corrugations: 0.032 inch 0.040 inch
24 thick.

25 Piping, Concealed:

26 All Service Jacketing with a self sealing lap. PVC Fitting Covers: 20 mils thick.

27 Piping, Exposed:

28 PVC: 20 mils thick. Up to 9' AFF.

29

30 Outdoor, Field-Applied Jacket Schedule

31 Install jacket over insulation material. For insulation with factory-applied jacket, install
32 the field-applied jacket over the factory-applied jacket.

33 If more than one material is listed, selection from materials listed is Contractor's option.

34 Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72
35 Inches:

36 Aluminum, Stucco Embossed: 0.016 inch thick.

37 Ducts and Plenums, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces

38 Larger Than 72 Inches:

39 Aluminum, Stucco Embossed with 1-1/4-Inch Deep Corrugations 0.032 inch thick.

40 Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

41 Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.016 inch thick.

42 Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger

43 Than 72 Inches:

44 Aluminum, Stucco Embossed with 1-1/4-Inch-Deep Corrugations: 0.032 inch thick.

45 Piping, Exposed:

46 Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.016 inch thick.

47

48 END OF SECTION

1 SECTION 23 0800 - MECHANICAL SYSTEMS COMMISSIONING REQUIREMENTS

2
3 GENERAL

4
5 Description

6 The purpose of this section is to specify responsibilities of this Division for participating in the
7 commissioning process as directed by the CxA.

8 The equipment and systems to be commissioned are listed in Division 1, Section 01 9100.
9 Commissioning requires the participation of this Division to ensure that all systems are
10 operating in a manner consistent with the Contract Documents. The general commissioning
11 requirements and coordination are detailed in Section 01 9100. This Division shall be familiar
12 with all parts of Division 1 as well as the Commissioning Plan issued by the CxA, and shall
13 execute all commissioning responsibilities assigned to them in the Contract Documents.

14 The following are common abbreviations used in these specifications and the *Commissioning*
15 *Plan*.

16	A/E	Architect and Design Engineers	Functional Performance Test
17	CC	Controls Contractor	General Contractor (Prime)
18	CM	APS Construction Manager	Mechanical Contractor
19	Cx	Commissioning	Owner’s Representative
20	CxA	Commissioning Authority	Prefunctional Checklist
21	Cx Plan	Commissioning Plan Document	Subcontractors to General
22	EC	Electrical Contractor	Test and Balance Contractor

23 *Normally APS Staff Architect or Construction Manager

24
25 Definitions

26 Refer to Section 01 9100.

27
28 Responsibilities

29 Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to
30 each of the mechanical, controls and TAB Contractors of this Division are as follows (*all*
31 *references apply to commissioned equipment only*):

32
33 Include the cost of commissioning participation in the contract price.

34 In each purchase order or subcontract written, include Cx requirements for submittal data, Cx
35 documentation, O&M data and training.

36 Attend a commissioning scoping meeting (Cx ‘Kickoff’) and other necessary meetings scheduled
37 by the CxA to facilitate the Cx process.

38 Provide normal cut sheets and shop drawing submittals of commissioned equipment to the CxA.

39 Provide additional requested documentation to the CxA for development of startup and
40 functional testing procedures.

41 Typically this will include detailed manufacturer installation/startup instructions, operating,
42 troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan
43 and pump curves, full factory testing reports (if any) and full warranty information, including all
44 responsibilities of the Owner to keep the warranty in force. In addition, the installation and
45 checkout materials that are shipped with the equipment, as well as the actual field checkout
46 sheet forms to be used by the factory or field technicians, shall be submitted to the CxA.

47 The CxA may request further documentation necessary for the commissioning process.

48 This data request may be made prior to normal submittals.

- 1 Provide a copy of the O&M manual submittals for commissioned equipment, through normal
- 2 channels, to the CxA for review and approval.
- 3 Assist the CxA in developing a full startup and initial checkout plan using manufacturer's
- 4 detailed startup procedures and/or the prefunctional checklists (PFCs) provided by the CxA.
- 5 Both the Contractor and CxA must agree on this plan prior to equipment startup.
- 6 Provide assistance to the CxA in preparing the specific functional performance test procedures.
- 7 Sub(s) shall review test procedures to ensure feasibility, safety and equipment protection, and
- 8 provide necessary written alarm limits to be used during the tests.
- 9 Assist (along with the design engineers) in clarifying the operation and control of commissioned
- 10 equipment in areas where the equipment documentation, specifications and/or control
- 11 drawings are not sufficient for writing detailed testing procedures.
- 12 Provide skilled technicians to execute starting of equipment and to execute the functional
- 13 performance tests. Ensure that they are available and present during the agreed upon
- 14 schedules and for sufficient duration to complete the necessary tests, adjustments and
- 15 problem-solving.
- 16 During the startup and initial checkout process, execute and document the Division-relevant
- 17 portions of the PFCs provided by the CxA for all commissioned equipment.
- 18 Perform and clearly document all completed startup and system operational checkout
- 19 procedures, providing a copy to the CxA.
- 20 Address current A/E punch list items before functional testing. Air and water TAB shall be
- 21 completed with discrepancies and problems remedied before functional testing of the
- 22 respective air- or water-related systems.
- 23 Perform functional performance testing under the direction of the CxA for specified equipment.
- 24 Assist the CxA in interpreting the monitoring data, as necessary.
- 25 Correct deficiencies (differences between specified and observed performance) as interpreted
- 26 by the CxA, CM and A/E and retest the equipment.
- 27 Prepare O&M manuals according to the Contract Documents, including clarifying and updating
- 28 the original sequences of operation to as-built conditions.
- 29 Prepare red-line as-builts for all relevant drawings, and final as-builts for contractor-generated
- 30 coordination drawings.
- 31 Provide training of the Owner's operating personnel as specified.
- 32 Coordinate with equipment manufacturers to determine specific requirements to maintain the
- 33 validity of the warranty.
- 34 Execute seasonal or deferred functional performance testing, witnessed by the CxA, according
- 35 to the specifications and Cx Plan.
- 36 Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for
- 37 applicable issues identified during seasonal testing.
- 38
- 39 Mechanical Contractor (MC). Responsibilities of the Mechanical Contractor during construction
- 40 and acceptance phases, in addition to those listed in (A) above, are:
- 41 Provide startup of all HVAC equipment, except for the building automation control system (BAS).
- 42 Install a P/T plug at each water sensor which is an input point to the BAS.
- 43 List and clearly identify on the as-built drawings the locations of all air-flow stations.
- 44 Assist and cooperate with the TAB Contractor and CxA by:
- 45 Putting all HVAC equipment and systems into operation and continuing the operation during
- 46 each working day of TAB and commissioning, as required.
- 47 Including cost of sheaves and belts that may be required by TAB.

- 1 Provide test holes with approved plugs in ducts and plenums where directed by TAB, to allow air
2 measurements and air balancing.
- 3 Provide temperature and pressure taps according to construction documents for TAB and
4 commissioning testing.
- 5 Prepare a preliminary schedule for Division 23 pipe and duct system testing / flushing / cleaning,
6 equipment startup, and TAB start / completion for use by the CxA. Update the schedule as
7 appropriate.
- 8 Notify the GC and CxA of actual pipe and duct system testing, flushing and cleaning, startup of
9 equipment and Test & Balance activities. Be responsible to notify the GC and CxA in advance if
10 it is suspected that commissioning activities not yet performed or not yet scheduled may delay
11 construction. Be proactive in seeing that commissioning processes are executed and that the
12 CxA has the scheduling information needed to efficiently execute the commissioning process.
- 13
- 14 Controls Contractor (CC). The commissioning responsibilities of the CC during construction and
15 acceptance phases, in addition to those listed in (A) above, are:
- 16 Provide Sequences of Operation Submittal. The CC's submittals of control drawings shall include
17 complete detailed sequences of operation for each piece of equipment, regardless of the
18 completeness and clarity of the sequences in the project specifications. If clarity from the
19 Engineer is required, the CC shall submit Requests for Information to gain sufficient information.
20 Include the following requirements:
- 21 Overview narrative of the system (1 or 2 paragraphs) generally describing its purpose,
22 components and function.
- 23 All interactions and interlocks with other systems.
- 24 Detailed delineation of control between any packaged controls and the building automation
25 system, listing:
- 26 Points the BAS monitors only;
- 27 Points the BAS controls;
- 28 Which controlled points are adjustable.
- 29 Written sequences of control for packaged controlled equipment. (Equipment manufacturers'
30 stock sequences may be included, but additional narrative is generally required.)
- 31 Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop,
32 staging, optimization, demand limiting, etc.
- 33 Sequences shall include (as applicable) startup, warm-up mode, normal operating mode,
34 unoccupied mode sequences, shutdown sequences, failure modes, capacity control sequences
35 and equipment staging, temperature and pressure control, setbacks, setups, resets, effects of
36 power or equipment failure (with all standby component functions), alarms, emergency shut
37 downs, and seasonal operational differences and recommendations.
- 38 Initial and recommended values for all adjustable setpoints and parameters that are typically set
39 or adjusted by operating staff; any other control settings, fixed values, delays, etc. that will be
40 useful during testing and operating the equipment.
- 41 Provide Control Drawings Submittal
- 42 The control drawings shall have a key to all abbreviations.
- 43 The control drawings shall contain graphic schematic depictions of the systems and each
44 component.
- 45 The schematics will include the system and component layout of any equipment that the control
46 system monitors, enables or controls, even if the equipment is primarily controlled by packaged
47 or integral controls.
- 48 Provide a full points list ('Point-to-Point') with at least the following included for each point:

- 1 Name of controlled system
 2 Point abbreviation
 3 Point description: (DB temp, airflow, etc.)
 4 Display unit of measure
 5 Type of point:
 6 Control point or setpoint: point that controls equipment and can have its setpoint
 7 changed (OSA, SAT, etc.)
 8 Monitoring point: point that does not control or contribute to the control of
 9 equipment, but is used for operation, maintenance, or performance verification
 10 Intermediate point: point whose value is used to make a calculation which then
 11 controls equipment (e.g. space temperatures that are averaged to a virtual point to
 12 control reset).
 13 Calculated point: 'Virtual' point generated from calculations of other point values.
 14 Controls Contractor shall keep the CxA informed of all changes to this list during
 15 programming and setup.
- 16 Provide a signed and dated certification ('Readiness Letter') to the CxA and GC after completing
 17 checkout of each controlled device/system, confirming that programming is complete per the
 18 Contract Documents and that the system is ready for functional testing.
- 19 Assist and cooperate with the TAB Contractor in the following manner:
 20 Meet with TAB Contractor prior to Test and Balance to review TAB plan and determine
 21 capabilities of the control system toward completing TAB. Provide TAB Contractor any unique
 22 instruments needed for setting terminal unit boxes, and instruct TAB in their use (e.g. handheld
 23 control system interface for use throughout building during TAB, etc.).
 24 For each given area, have all required prefunctional checklists, calibrations, startup tasks and
 25 selected functional tests reviewed and approved by CxA prior to TAB.
 26 Provide a qualified technician to operate the controls during TAB, or provide sufficient training
 27 for TAB Contractor to operate system without assistance.
- 28 Assist and cooperate with the CxA in execution of functional testing of the controls system,
 29 mechanical equipment, electrical equipment and trend logs as specified in the Construction
 30 Phase Commissioning Plan.
- 31 Include an updated as-built version of the control drawings and sequences of operation in the
 32 final controls O&M manual submittal.
- 33 List and clearly identify on the as-built duct and piping drawings the locations of all static and
 34 differential pressure sensors (air, water and building pressure).
- 35
- 36 TAB Contractor. The duties of the TAB Contractor, in addition to those listed in (A) above, are:
 37 Six weeks prior to starting TAB, submit to GC the qualifications of the project TAB technician for
 38 approval by Owner and documentation by CxA.
- 39 Submit outline of the TAB plan and approach for each system and component to the CxA, GC
 40 and CC six weeks prior to starting Test and Balance. Plan will be developed after TAB Contractor
 41 has familiarity with the control system.
- 42 Submitted plan shall include:
 43 Copies of all testing and reporting forms to be used for TAB on this project.
 44 Detailed step-by-step procedures for TAB work for each system. List all air flow, water flow,
 45 sound level, system capacity and efficiency measurements to be performed and a description of
 46 specific test procedures, parameters, formulas to be used.
 47 Identification and types of measurement instruments to be used and their most recent
 48 calibration date.

- 1 Details regarding specified deferred or seasonal TAB work.
2 Details of any specified false loading of systems needed to complete TAB work.
3 Maintain running log of events and issues identified by the TAB field technicians. Submit hand-
4 written reports of discrepancies, deficiencies, uncompleted work, contract interpretation
5 requests and lists of completed tests to the CxA and GC at least once a week.
6 Communicate in writing to the Controls Contractor all setpoint and parameter changes made or
7 problems and discrepancies identified during TAB which affect the control system setup and
8 operation.
9 Provide a draft TAB report within two weeks of completion. A copy will be provided to the CxA.
10 The report should follow the latest and most rigorous reporting recommendations by AABC,
11 NEBB or ASHRAE Standard 111.
12 Provide the CxA with any requested data gathered but not shown on the draft reports.
13 Provide final TAB report, with a copy for the CxA, with details as in the draft.
14 Conduct functional performance tests and checks as specified in the Construction Phase
15 Commissioning Plan. CxA will normally witness and verify 10% of TAB Contractor's
16 measurements.

17

18 PRODUCTS

19

20 Test Equipment

- 21 Contractor is to provide all tools, equipment and instrumentation required to test relevant
22 systems per the Cx Plan.

23

24 EXECUTION

25 Submittals

- 26 Division shall provide submittal documentation relative to commissioned systems as requested
27 by the CxA.

28

29 Startup

- 30 The Mechanical and Controls Contractors shall follow the startup and initial checkout
31 procedures listed in 1.3 'Responsibilities' of this section, as well as in Section 01 9100.
32 Contractor has startup responsibility and is required to complete systems and sub-systems so
33 they are fully functional, meeting the design objectives of the Contract Documents. The acts of
34 participating in the commissioning process and performing functional testing do not relieve,
35 lessen or shift Contractor's responsibility for providing such a result.

36

- 37 Functional testing is intended to begin upon completion of a system's installation. Functional
38 testing may proceed prior to the completion of a system or sub-system at the discretion of the
39 CxA and CM. Beginning system testing before completion does not relieve the Contractor from
40 fully completing the system, nor from completion of PFCs for that system.

41

42

43 Functional Performance Tests

- 44 Refer to Section 01 9100 for a list of systems to be commissioned and for details of the
45 Functional Performance Testing process.

46

47 Documentation, Non-Conformance And Approvals

1 Refer to Section 01 9100 for specific details on non-conformance issues relating to Prefunctional
2 Checklists.

3
4 Refer to Section 01 9100 for details on deficiencies and non-conformance issues relating to
5 Functional Performance Tests.

6
7 Operation And Maintenance (O&M) Manuals

8 Contractor(s) and Sub(s):
9 Provide a copy of the O&M manuals to the CxA for review.

10
11 Controls Contractor:

12 Provide field checkout sheets and trend logs to the CxA for inclusion in the Commissioning
13 Report.

14
15 TAB Contractor:

16 Provide final Test and Balance report to the CxA, containing methodology, assumptions, test
17 conditions and results in a clear format.

18 Mark on the drawings where all traverse and other critical measurements were taken and cross
19 reference locations in the TAB report.

20
21 Review and approval of the commissioning related sections of the O&M manuals shall be made
22 by the A/E and the CxA. Refer to Division 1.

23
24 Training Of Owner Personnel

25 Refer to Section 01 9100 for details about general training responsibilities and training manuals
26 for commissioned systems.

27
28 Mechanical Contractor (MC). The Mechanical Contractor shall have the following training
29 responsibilities:

30 Provide the CxA with a training plan two weeks before the planned training according to the
31 outline described in Section 01 9100.

32 Provide designated Owner personnel with comprehensive orientation and training in the
33 understanding of the systems and the operation and maintenance of each piece of HVAC
34 equipment.

35 Training shall normally start with classroom sessions followed by hands-on training on each
36 piece of equipment, illustrating the various modes of operation including startup, shutdown,
37 fire/smoke alarms, power failure, resets, etc.

38 During any demonstration, should the system fail to perform in accordance with the
39 requirements of the O&M manual or sequence of operations, the system will be repaired or
40 adjusted as necessary and the demonstration repeated.

41 Trainer(s) for each trade shall possess practical building operating expertise as well as in-depth
42 knowledge of all modes of operation for their specific piece(s) of equipment. Trainers may
43 include the startup technician, installing contractor and/or manufacturer’s representative. More
44 than one party may be required to execute the training.

45 Training sessions shall follow the outline in the Table of Contents of the Operation and
46 Maintenance manual, and illustrate whenever possible the use of the O&M manual as a
47 practical reference.

1 The format and training agenda described in *The HVAC Commissioning Process, ASHRAE*
2 *Guideline 0* is recommended.

3
4 Training shall include:

5 Use of the printed installation, operation and maintenance instruction material included in the
6 O&M manuals.

7 A review of the written O&M instructions emphasizing safe and proper operating requirements,
8 preventative maintenance, special tools needed and spare parts inventory suggestions

9 Discussion of relevant health and safety issues and concerns.

10 Discussion of warranties and guarantees.

11 Common troubleshooting problems and solutions.

12 Explanatory information included in the O&M manuals and the location of all plans and manuals
13 in the facility.

14 Discussion of any peculiarities of equipment installation or operation.

15 Classroom sessions shall include the use of visual aids as appropriate.

16 Hands-on training shall include startup, operation in all modes possible, including manual, shut-
17 down and any emergency procedures, plus preventative maintenance for all pieces of
18 equipment.

19 The Mechanical Contractor shall fully explain and demonstrate the operation, function and
20 overrides of any local packaged controls not controlled by the BAS.

21 Training shall occur after functional testing is complete, unless approved otherwise by the
22 Project Manager.

23
24 Controls Contractor (CC). The Controls Contractor shall have the following training
25 responsibilities:

26 Provide the CxA with a training plan four weeks before the planned training.

27 Provide designated Owner personnel comprehensive training on the control system in this
28 facility. The intent is to clearly and completely instruct the Owner on all capabilities of the
29 control system.

30 Trainings will be tailored to the needs and skill level of the trainees.

31 Trainers must be knowledgeable on the system and its use in buildings. For the on-site sessions,
32 the most qualified trainer(s) will be used. The Owner shall approve the instructor(s) prior to
33 scheduling the training.

34 During any demonstration, should the system fail to perform in accordance with the
35 requirements of the O&M manual or sequence of operations, the system will be repaired or
36 adjusted as necessary and the demonstration repeated.

37 The Controls Contractor shall attend sessions other than the controls training, as requested, to
38 discuss the interaction of the controls system as it relates to the equipment being discussed.

39
40 Deferred Testing

41 Refer to Section 01 9100 for requirements of deferred testing.

42
43 Written Work Products

44 Written work products of Contractors will consist of the startup and initial checkout plans
45 described in Section 01 9100 and the filled out startup and Prefunctional Checklists (PFCs), plus
46 O&M documentation as required.

47
48 END OF SECTION

1 SECTION 23 0900 - INTEGRATED AUTOMATION FACILITY CONTROLS

2
3 GENERAL

4
5 Requirements

6 The entire Building Automation System specified hereafter shall be approved and listed
7 by underwriters' Laboratories, Inc., under UL 916 (Energy Management Equipment).
8 Conform to applicable provisions of the General Conditions, and General Requirements
9 of this project document.

10 Scope Of Work

11 The work covered by this specification and related sections consists of providing all shop
12 drawings, equipment, labor, materials, engineering, technical supervision, and
13 transportation required to furnish and install an Internet-based Systems manufactured
14 by Automatic Logic, ~~Allerton or Trane~~ Building Automation System (BAS), in strict
15 accordance with these specifications and subject to the terms and conditions of the
16 contract. The Albuquerque Public Schools have standardized on the aforementioned
17 manufacturers of controls equipment, provided and installed by Integrated Control
18 Systems (the system currently at this campus), ~~Automated Control systems or the Trane~~
19 ~~company~~. No other BAS system will be accepted. The operating software for this system
20 shall be BacNet via the existing school district network with monitoring, alarming and
21 control capabilities by Integrated Control Systems, ~~Automated Control systems or the~~
22 ~~Trane company~~. All software shall be installed and integrated using BacNet. No
23 deviations to this interface requirement shall be submitted for approval or offered as an
24 alternate without written approval from the owner and the owner's representative.

25
26 The system shall be connected to the Local Area Network (LAN) system and Wide Area
27 Network (WAN) which shall include the points detailed in these specifications. This
28 contractor as part of his bid shall furnish all hardware, software, wiring, conduit, labor
29 and any other required equipment needed but not specified, or shown, to complete this
30 project. The system must have provisions for addition of a campus wireless
31 communication network via the 802.11a, b and g protocols to provide for
32 communication which must conform to standards of being capable of running a web
33 browser of the latest standards.

34
35 The BAS contractor shall provide the owner with "as Built" installation copies of all
36 installed software, graphics, points lists, operating software and the final acceptance
37 tests of the installed BAS system, equipment and software at the completion of the
38 project operational test.

39
40 The work by the Contractor, consists of, but is not limited to the following:

41
42 Provide and install the BAS System including Building Automation for Heating,
43 Ventilating, Air Conditioning and Lighting along with the preparation of
44 submittal documents and provision of all related services.

45
46 Furnish and install data communications necessary to effect a BAS data
47 transmission system for all integrated control systems, to the host computer

48
49 Be compatible with all computer network protocols, particularly the system

1 used by the schools system.

2
3 Provide for future system expansion capability to add as many points as demand
4 may require as well as additional wireless capabilities.

5
6 Furnish and install a Web Browser Interface, and Enterprise Interface including
7 displayed system graphics that do not require HTML programming, and a
8 Sustainability Dashboard to summarize facility sustainability metrics.

9
10 Furnish and load all hardware and software required to implement a complete
11 operational BAS System.

12
13 Complete training of operators including all operation and maintenance
14 manuals.

15
16 Accomplish factory and acceptance test.

17
18 Provide full documentation of all hardware and software.

19
20 Demonstrate Integration with district wide systems including the capability to
21 monitor the system over the Internet. Provide all miscellaneous work as
22 indicated in the specifications.

23
24 Provide battery backup to the controls system data when a user interface is
25 provided.

26
27 Prior Approval:

28 Automatic Logic, ~~Allerton or Trane~~ manufactured equipment is the only equipment
29 approved to be installed, and shall be provided and installed by Integrated Control
30 Systems, ~~Automated Control systems or the Trane~~ company. No other BAS system will
31 be accepted.

32
33 Submittal:

34 Within thirty (30) days after award of the Contract and before start of construction, ten
35 (10) sets of drawings, specifications, and hardware and software data will be submitted
36 for review by the Owner Representative. All material or data not approved, or in
37 conflict with specification requirements, shall be re-submitted for final approval prior to
38 ordering equipment. Thirty (30) days will be required for review by the Owner
39 Representative. The review does not constitute approval or acceptance of any
40 variations from the request for proposals or from the proposal unless; changes in the
41 specification have been specifically pointed out in writing by the Contractor. After the
42 necessary changes have been made to the drawings and submittal the contractor, the
43 Owner Representative will retain two (2) sets of all submittal data for their records.
44 Work shall not be started until the submittal has been approved.

45
46 Submittal drawings shall include:

47
48 Locations of Field Equipment Panels (FEP) and Remote Processing Units (DCU)
49 cable runs, sensors, and relays will be shown on plan views of the building.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49

Designation of FEP terminal connections to points listed in the Input/Output Summary.

Standard function diagrams for each different type of point listed in the Input/Output Summary.

Mounting details and locations for sensors and actuators shown on the standard function diagrams.

PRODUCTS

Sensors And Control Devices:

Provide all remote relays, sensing points and instrumentation as required to complete the Control and Building Automation System. All sensors shall be of industrial grade and be compatible with existing equipment.

All water sensors shall be two (2) wires, 4-20 milliamp electronic transmitters with converters of linear analog signals over the entire range, compatible with the PCU. They shall be factory calibrated to plus or minus 1% of full range and shall be provided with field adjustable zero and span. All other sensors installed in water shall be +/- 3% of full scale reading.

Thermowells are required in all fluid applications, the sensor and well shall be supplied as a complete assembly including separable socket. All chilled water sensors subject to condensation in the temperature well shall be hermetically sealed in the temperature well. Hermetical seal shall be in accordance with manufacturer's instructions.

Thermowells shall be constructed as to be compatible with the medium being measured and shall make use of a spring loaded sensor assembly or equivalent to assure sensor contact with the tip of the thermowells.

All thermowells and sensors shall be mounted to allow easy access to the sensor for repair and replacement.

All duct mount sensors shall be sized to the duct being measured and be of type selected for specific use as shown on the point list. The range of the sensors will be 32 degrees F to 176 degrees F.

Duct mount sensors shall mount through a hole in the duct and be positioned as to be easily accessible for repair or replacement. A seal shall be used on the sensor assembly to prevent air leaks.

All sensors and control devices shall be capable of operating continuously in environments of 32 degrees F to 122 degrees F and up to 100% relative humidity.

Digital inputs for monitoring status of operating units are performed by the use of current transformers (CT) that shall have adjustable amperage switching points.

1
2 Analog output controllers shall have supply standard industrial outputs of 0-10VDC, and 0-5VDC.
3

4 Pressure sensors shall be of the electronic transmitter, of industrial quality, with
5 pressure ranges suitable to the application. These sensors shall require no field
6 calibration and shall have an accuracy of +/- 2% full range.
7

8 Relative humidity sensors shall be duct or room type depending on the
9 application. Range shall be 0-100% RH with an accuracy of +/- 2% of span.
10

11 Carbon dioxide (CO₂) sensors shall be duct or room type depending on the
12 application. Range shall be 0-2000 ppm with an accuracy of +/- 40 ppm plus 3%
13 of reading at 72°F.
14

15 Occupancy sensors shall be ceiling mounted unit with dual technology of passive
16 infrared and ultrasonic technologies with 360° coverage up to 1,000 sq. ft.
17 occupancy area.
18

19 Photocell sensors shall be vertical wall or horizontal ceiling mounted unit
20 utilizing photodiode element to continuously measure ambient light level.
21 Range shall be 0-100 foot candles with an accuracy of +/- 1% of span.
22

23 Pyranometer sensors use a silicon photovoltaic detector mounted in a cosine-
24 corrected head to provide solar radiation measurements, sensor shall accurately
25 measure sun plus sky radiation for the spectral range of 300 to 1100 nm, with
26 an absolute accuracy of +/- 5% for daily total radiation. The standard output is
27 0.2 mV per W/m², with a measurement range of 0 – 2000 W/m² which provides
28 a signal of 200 mV in full sunlight (1000 W/m²). Pyranometer sensors shall be
29 capable of mounting at incident angle of solar collector panels or on a horizontal
30 level (provide with built-in alignment bubble).
31

32 Digital inputs for monitoring status of window unit's position are performed by
33 the use of closure contacts interfaces with room controller.
34

35 Each room sensor shall be an intelligent room thermostat (BACstat) which shall
36 allow the occupant to adjust the room temperature within the parameters set
37 by the Physical Plant Manager through the Host computer. The BACstat shall
38 also allow the occupant to override the night setback and bring the space
39 temperature back to normal occupied mode set point
40

41 Automatic Control Operators:

42 The contractor shall provide all automatic control operators as required to make a fully
43 functioning system. All automatic operators shall be made by Belimo Controls and shall
44 have DDC dc drives sized to tightly close against all system pressures.
45

46 Automatic Control Valves:

47 The controls contractor shall provide all automatic control valves required by the
48 specifications and drawings.
49

1 The fan coil and heating coil control valves shall be Belimo Pressure Independent
2 Characterized Control Valve, sized to match specified flow rate of fan coil/heating coil,
3 differential pressure operating range 5 to 50 PSI, with non-spring return actuator,
4 integral automatic flow control, two-way valve with chrome plated brass ball and brass
5 stem, NPT female ends. Three-way valves will be required at end of piping runs as noted
6 on drawings and valve schedule. Control valves shall be software programmed to open
7 when fan coil unit/heating coil is energized on command from the DCU.
8

9 The controls contractor shall provide all line set flex hose and pipe fittings for fan coils
10 and heating coils. Equipment shall be Belimo products. Supply line set includes
11 combination wye strainer, shut off valve, T/P port, drain valve, union and flex hose.
12 Return line set includes combination air vent, shut off valve, T/P port, union and flex
13 hose. Additional fittings for three-way valves will be provided.
14

15 These valves and line sets shall be mounted and piped by the mechanical contractor –
16 Div 22.
17

18 Automatic Dampers

19 All automatic dampers, except for automatic dampers specified with air handling units,
20 shall be furnished under this section of the specifications. These dampers shall be
21 manufactured by Ruskin and shall be installed by the sheet metal subcontractor.
22

23 All dampers shall be parallel blade type automatic dampers for air mixing applications.
24 Dampers shall be constructed of galvanized sheet steel or extruded aluminum with iolite
25 bronze or Teflon bearings and trunnions of non-corrosive materials. Each blade and
26 edge shall have a positive closing butyl-rubber or neoprene edge seal, and spring
27 loaded side seals
28

29 Processor Control Unit (Pcu):

30 The PCU is a microprocessor-based remote processing unit with the latest generation
31 advanced electronics, software and firmware for process control, alarm notification, and
32 monitoring applications. It shall be capable of full stand-alone operation during loss of
33 communications with the balance of the system.
34

35 The PCU controller shall be configured with either remote I/O input points or on board
36 I/O points consisting of: 4-Digital Outputs (DO); 4-Universal Inputs (UI); 4 temperature
37 Inputs (TI); and 4-Digital Inputs (DI). The PCU shall be capable of minimum expansion
38 through auxiliary I/O modules as follows: 5-DO; 4-DI; 2-AO; and 10-AI. All I/O's will have
39 a LED display and over-ride capability. All AO's shall have HOA switches with adjustable
40 set point adjust inputs for manual control.
41

42 The Control System is a stand-alone system that is capable of driving any number of
43 remotely located Auxiliary I/O modules and is freely programmable. All controllers can
44 have an Operator Panel (OP) attached to report all system activity and data.
45

46 The PCU incorporates a crystal-controlled real time clock with 5-year battery back-up
47 power for the CMOS time circuit. Month, day, week, hour, minute and second, will be
48 retained by the battery back-up.
49

1 All RAM memory will be fully backed-up during power loss. Automatic reload of
2 operating parameters will take place on power restoration. All PCU's shall be capable of
3 a "soft" equipment start on a power failure or reload of a new software program.
4

5 The microprocessor will be housed in a U.L. cabinet and the front door will be lockable
6 with the standard ENMU BAS key.
7

8 The Master controller will process application and control programs as detailed in the
9 project specifications. Each unit will be provided with all programs and will be capable
10 of retaining system data for transmission to the Host System on demand.
11

12 The system shall be provided with a RS485 transmission and communications port. The
13 ports will operate at 76,800 Baud rate and will packet file batch transfer all alarms to
14 the Host as soon as they activate.
15

16 The Master controller shall have 12 PID control loop controls connected in cascade, 6 control
17 characteristics curves, 16 time schedules, pulse counting modules and 8 run time
18 modules.
19

20 Zone Controllers:

21 Zone controllers for control of heat pumps units and classroom lighting shall be
22 stand-alone full DDC controllers with PID control loops. All information required
23 for heat pump control logic shall be held in the Zone controller memory and
24 backed-up in the Host computer. The Host computer shall act as a master
25 memory destination. Programming shall be by either local hand held console or
26 through any of the LAN connection points with the software for full control of
27 supply fan, heating or cooling mode, lighting circuit control, based on
28 thermostat inputs, window closure status, interior footcandle lighting sensor
29 plus supply air temperature sensors, and (selected) room CO₂ sensor. Each zone
30 controller shall be provided with a space sensor that shall have a set point
31 adjustment capability.
32

33 Zone controllers for control of fan coil units or ventilators shall be stand-alone
34 full DDC controllers with PID control loops. All information required for fan coil
35 or unit ventilator control logic shall be held in the Zone controller memory and
36 backed-up in the Host computer. The Host computer shall act as a master
37 memory destination. Programming shall be by either local hand held console or
38 through any of the LAN connection points with the software for full control of
39 supply fan, heating or cooling mode, plus supply air temperature sensors. Each
40 zone controller shall be provided with a space sensor that shall have a set point
41 adjustment capability.
42

43 The T&B contractor, through the zone controllers, shall set all cfm requirements
44 to maintain space temperatures
45

46 Each zone controller space sensor shall have a RJ45 plug-in jack for connection
47 to a remote Hand Held Computer for data retrieval, control changes and
48 programming
49

1 Energy Recovery Ventilator shall be connected to the building computer and
2 Local Area Network (LAN) system for communications with the software for full
3 control of supply air fan, exhaust air fan, and recovery wheel motors, motor
4 status CT's, air filter pressure sensors, and supply, return, exhaust and intake air
5 temperature sensors, plus selected room and return duct CO₂ sensors.
6

7 Roof Top AC system shall be connected to the building computer and Local Area
8 Network (LAN) system for communications with the software for full control of
9 mixed air, supply fan, refrigerant compressor or evaporative cooling pump,
10 furnace section stage(s), supply air return air temperature sensors, air filter
11 pressure sensors, and status CT's for fan (or pump) motors,
12

13 Boilers and associated pumps system shall be connected to the building
14 computer and Local Area Network (LAN) system for communications with the
15 software for enable and disable of boiler units and step control of boiler
16 capacity, with boiler supply and return water sensors, and status CT's for pump
17 motors, plus alarm output signal from boiler units.
18

19 Chillers and associated pumps system shall be connected to the building
20 computer and Local Area Network (LAN) system for communications with the
21 software for enable and disable of chiller units and step control of chiller
22 compressors and condenser fans, with chiller supply and return water sensors,
23 and status CT's for pump motors, plus alarm output signal from chiller units.
24

25 Chillers (Water Cooled) and associated pumps system shall be connected to the
26 building computer and Local Area Network (LAN) system for communications
27 with the software for enable and disable of chiller units and step control of
28 chiller compressors, or VFD drive, with chiller supply and return water sensors,
29 cooling tower supply and return water sensors, and status CT's for pump
30 motors, plus alarm output signal from chiller units.
31

32 Cooling Tower and Plate/Frame Heat Exchanger (if applicable) systems shall be
33 connected to the building computer and Local Area Network (LAN) system for
34 communications with the software for enable and disable of cooling tower fan
35 with VFD, cooling tower pump, plus cooling tower and heat exchanger supply
36 and return water sensors, and status CT's for fan and pump motors, plus
37 vibration alarm signal from cooling tower controls.
38

39 Hot Water or Chilled Water Loop Circulation Pumps system shall be connected
40 to the building computer and Local Area Network (LAN) system for
41 communications with the software for enable and disable of pumps units and
42 adjust VFD setting to control flow rate of system, with loop supply and return
43 water sensors, and status CT's for pump motors, analog output signals to VFD's
44 based pressure differential sensors at discharge and selected locations of the
45 piping distribution system. Plus alarm output signal from VFD's.
46

47 Heat Pump Loop Circulation Pumps system shall be connected to the building
48 computer and Local Area Network (LAN) system for communications with the
49 software for enable and disable of pumps units and adjust VFD setting to control

1 flow rate of system, with loop supply and return water sensors, and status CT's
 2 for pump motors, analog output signals to VFD's based pressure differential
 3 sensors at discharge and selected locations of the piping distribution system.
 4 Plus alarm output signal from VFD's.

5
 6 Exhaust fan system shall be connected to the building computer and Local Area
 7 Network (LAN) system for communications with the software for enable and
 8 disable of exhaust fan units and status CT's for fan motors.

9
 10 Space Lighting systems and associated sensors system shall be connected to the
 11 building computer and Local Area Network (LAN) system for communications
 12 with the software for enable and disable of lighting circuits and dimming control
 13 (as applicable), with space occupancy sensors, light level sensors and manual
 14 over-ride switches for selected lighting circuits.

15 Gutter, Conduit And Fittings:

16 Conduit for control wiring, control cable, and transmission cable shall be electrical
 17 metallic tubing (EMT) with compression fittings, cold rolled steel, zinc coated, or zinc-
 18 coated rigid steel with threaded connections. Rigid conduit shall be provided in all areas
 19 exposed to possible damage. Gutter shall be used where multiple cables are installed.
 20

21
 22 Outlet boxes (exposed to weather) shall be threaded hub cast aluminum or iron boxes
 23 with gasket device plate.

24
 25 Pull and junction boxes shall be sized according to number, size and position of entering
 26 raceway as required by N.E.C. Code. Enclosure type shall be suited to location.
 27

28 Duct Smoke Detectors

29 Provide in each AC unit return and supply duct, unless specified in the fire alarm section,
 30 an ionization duct detector with an Underwriters Laboratories listing. The units shall be
 31 self-contained and shall be furnished with sampling tubes made of EMT tubing. The
 32 length of the tubing shall match the duct size and shall be supported as required to
 33 extend across the plenum or duct.
 34

35 Field Equipment Panels (Fep):

36 Field Equipment Panels shall house auxiliary relays used for start and stop
 37 functions, interlocking relays, transducers and terminal blocks necessary for
 38 interconnecting wiring terminations. The panel shall match the DCU panel and
 39 shall have a gutter mounted above it for conduit terminations. All field
 40 equipment shall terminate on marked terminal blocks.
 41

42 Internet-Based System:

43 Provide a complete Internet-based system using only top of the line equipment
 44 to control and monitor the equipment as described on the plans. The system
 45 shall be controlled from the software at the Central Campus Physical Plant, via
 46 the BAS Host computer and via the Internet.
 47

48 Enterprise Interface

49 ODBC driver supporting common SQL statements (select, update, insert, where,

1 order by, group by, etc.)

2
3 Allow integration to Enterprise software

4
5 Shall be capable of being used with third party software that supports ODBC
6 connection such as: Microsoft Access, Excel, Crystal Reports, etc.

7
8 All queries shall be real time into live controller network.

9
10 Shall be able to both read and write using SQL.

11 Web Browser Interface

12 The system shall be capable of supporting an unlimited number of clients using
13 a standard Web browser such as Internet Explorer™ or Netscape Navigator™ or
14 Firefox.

15
16 The Web browser software shall run on any operating system and system
17 configuration that is supported by the Web browser. Systems that require
18 specific machine requirements in terms of processor speed, memory, etc., in
19 order to allow the Web browser to function with the BAS, shall not be
20 acceptable.

21
22 The Web browser shall provide the same view of the system, in terms of
23 graphics, schedules, calendars, logs, etc., and provide the same interface
24 methodology as is provided by the Graphical User Interface. Systems that
25 require different views or that require different means of interacting with
26 objects such as schedules, or logs, shall not be permitted.

27
28 The Web browser client shall support at a minimum, the following functions:
29 User log-on identification and password shall be required. If an unauthorized
30 user attempts access, a blank web page shall be displayed. Security using Java
31 authentication and encryption techniques to prevent unauthorized access shall
32 be implemented.

33
34 Graphical screens developed for the GUI shall be the same screens used for the Web
35 browser client. Any animated graphical objects supported by the GUI shall be supported
36 by the Web browser interface.

37
38 HTML programming shall not be required to display system graphics or data on a Web
39 page. HTML editing of the Web page shall be allowed if the user desires a specific look
40 or format.

41
42 Storage of the graphical screens shall be in the Server, without requiring any graphics to
43 be stored on the client machine. Systems that require graphics storage on each client
44 are not acceptable.

45
46 Real-time values displayed on a Web page shall update automatically without requiring
47 a manual "refresh" of the Web page.

48
49 Users shall have administrator-defined access privileges. Depending on the access

1 privileges assigned, the user shall be able to perform the following:
 2 Modify common application objects, such as schedules, calendars, and set points in a
 3 graphical manner.

4
 5 Holidays shall be set by using a graphical calendar, without requiring any keyboard entry
 6 from the operator.

7
 8 Commands to start and stop binary objects shall be done by right-clicking the selected
 9 object and selecting the appropriate command from the pop-up menu. No entry of text
 10 shall be required.

11
 12 The system shall provide the capability to specify a user's (as determined by the log-on
 13 user identification) home page. Provide the ability to limit a specific user to just their
 14 defined home page. From the home page, links to other views, or pages in the system
 15 shall be possible, if allowed by the system administrator.

16
 17 Graphic screens on the Web Browser client shall support hypertext links to other
 18 locations on the Internet or on Intranet sites, by specifying the Uniform Resource
 19 Locator (URL) for the desired link.

20 21 Submetering Devices

22 General

23
 24 All Devices provided under this section will be installed by mechanical contractor or
 25 electrical contractor as applicable

26 27 Electrical Sub Meter

28
 29 Coordinate integrations requirements with electrical meters to be provided by
 30 electrical contractor. ~~The power meter shall be fully electronic with multi-line
 31 backlit LCD display showing measured parameters as well as alarm functions
 32 and pulse output or BacNet communication protocol.~~
 33 ~~The power meter shall be Veris E50 series or pre-approved equivalent.~~
 34 ~~Electric Sub Meter shall be installed by Div 26.~~

35 Natural Gas Meters.

36 ~~Natural Gas meter shall be American Meter Company AM250 with pulse output
 37 or pre-approved equivalent.~~
 38 ~~Natural Gas Meter shall be installed by Div 22.~~

39 40 Water Sub Meters

41
 42 ~~1/2 to 1 1/2" Water Sub Meters shall be AMCO C700 positive displacement
 43 water meter with pulse output or pre-approved equivalent.~~

44
 45 ~~2" and larger Water Sub Meters shall be AMCO EvoQ4 electromagnetic water
 46 meter or pre-approved equivalent.~~

47
 48 ~~Water Sub Meters shall be installed under Div 22.~~
 49

1 BAS System Interface

2 All Sub Meters shall be interfaced with the Building Automation system via
3 BacNet or Pulse output.
4

5 EXECUTION

6
7 Verification Of Dimensions;
8

9 The Contractor shall visit the proposed site, or location, to become thoroughly
10 familiarize with all details of the work and working conditions and verify all
11 dimensions in the field, and shall advise the General Contractor of any
12 discrepancy before performing any work or purchasing any equipment. The
13 Contractor shall be specifically responsible for the coordination and proper
14 relation of his work to the building and to the work of all trades
15

16 Delivery And Storage:

17 Materials and equipment shall be delivered safely, properly stored, and
18 adequately protected and carefully handled to prevent damage before and
19 during installation. Equipment and material shall be handled, stored, and
20 protected in accordance with the manufacturer's recommendations. Damage or
21 defective items shall be replaced at no cost to the Owner. All shipments to the
22 construction job site shall be at the Contractor's expense.

23 Risks:

24 During periods of shipment, installation, and prior to completion of the successful performance
25 period, the Owner shall be relieved from all risks of loss or damage to the equipment, except
26 when such loss or damage is to the fault or negligence of the Owner.
27

28 Wiring And Safety Requirements:

29 Electrical work shall be in accordance with NFPA 70 and ANSI C2. All cabling will be installed in
30 accordance with the State of New Mexico specification for control cabling. Electrical wiring,
31 terminal blocks and other high voltage contacts shall be fully enclosed or properly guarded and
32 marked to prevent accidental injury to personnel.
33

34 All wire and cable required by the Contractor shall be the responsibility of the
35 contractor. All conduits shown on the electrical drawings will be furnished under
36 Division 16; all other conduit required for the section will be provided by the Contractor.
37 The term "wire" shall be construed to include furnishing of low voltage wire, cable,
38 miscellaneous material and labor as required installing a total working BAS system. If
39 departures from the contract drawings are deemed necessary by the Contractor, details
40 of such departures, including changes in related portions of the project and the reasons
41 therefore, shall be submitted with the drawings to the Owner's Representative for
42 approval.
43

44 It shall be the responsibility of this Contractor to provide adequate connections and
45 extensions to adequate sources of power (local emergency panel boards) to the various
46 items of equipment requiring power under this contract unless specified or shown to be
47 provided by the electrical contractor. Contractor may utilize spare circuits or space for
48 spare circuit breakers where available in panel boards but work shall not include
49 furnishing and installation of additional necessary panel boards. Branch circuits serving

equipment under this Contract shall be separate and used only for such equipment. All branch circuit conductors 120 volt or greater shall be at least 12 gauge copper, type THW, 600 volt, insulated, installed in minimum 3/4-inch conduit (EMT).

Circuit Requirements:

Communications Circuits:

All circuits originating at the FEP and terminating at a sensor or controlled device shall be multiple wire circuits as required to provide the function specified.

All cables shall have protective sheathings which shall be waterproof and capable of withstanding continuous temperatures of 175 degrees F with no measurable effects on the physical or electrical properties of the cable.

Ample shielding and grounding to prevent interference and distortion from adjacent power cables, television cables, etc., shall be an integral part of the transmission cable.

Cables shall not be installed closer than one (1) foot from transformers or electrical power cables. Care shall be taken to route the cable as far from interference generating devices as possible.

All shields shall be grounded (earth ground) at one end only, preferably at the FEP terminal panel, to eliminate ground loops.

Trunk And Branch Cables:

Wire size shall be No. 20 AWG minimum, stranded copper, with pairs twisted, overall shield and specified for standard installations. Grounded and shielded cables may be required but are not to be used on the network.

All multi-bundle cables shall contain at least 12-wire (six pair), and be twisted, with an overall Mylar drain shield, all other cables shall be two pair.

Maximum voltage shall be 24 volts ac, or 50 volts dc, and limited to 24 milliamps.

Sensor And Control Wiring:

Sensor wire shall be 2-wire stranded, twisted, shielded, and No. 22 gauge with at least two (2) pair per cable.

Binary control and input function wiring shall be 2-wire stranded, twisted, shielded and of No. 18 gauge.

Analog output control function shall be 3-wire stranded, twisted, shielded and No. 22 gauge for control and No. 18 gauge for power.

Splices:

Splices are not allowed between sensors and the FEP panel. Splices are allowed in communication line junction boxes, but not in non-accessible areas.

1
2 Splices in shielded cables shall use shielded cable couplers which maintain the integrity
3 of the shielding. Terminations shall be in accessible locations. Cables shall be harnessed
4 with cable ties.

5
6 Splices in cables shall consist of terminations and the use of shielded cable couplers
7 which maintain the integrity of the shielding. Each cable shall be cut to length required
8 and terminated in a connector, impedance matched to the specific ties. If necessary to
9 solder cables, care should be taken to not overheat the insulating material. The same
10 precaution applies when using material of heat-shrink tubing. The use of "scotchcast"
11 type kits, or approved equal, shall be used for splicing cables which are susceptible to
12 heat or water damage. Polarity and color code shall be maintained at all connections.
13
14
15

16 Cable Runs:

17 Cable runs shall be kept as short as possible, allowing extra length for connecting to the terminal
18 strips. Fiber cables shall not be bent in a radius less than ten times the cable outside diameter.
19

20 Conduit Installation:

21 Conceal conduit within finished shafts, ceilings and walls as required. Install exposed
22 conduit parallel with or at right angles to the building walls. Cable in concealed areas
23 may be run without conduit.
24

25 Use electrical metal tubing (EMT) or UL approved wiring in buildings. All equipment
26 rooms shall be piped with EMT.
27

28 Use rigid metal conduit where exposed to physical damage.
29

30 Route all conduit to ceiling beams, plates, footings, and structural members.
31

32 Seal conduits as follows:
33

34 Caulking with a fireproof seal for a complete watertight system, where conduit
35 is run between floors and through walls of fireproof shaft.
36

37 UL approved fire caulking, watertight where penetrations are made through
38 outside foundation walls, shall be used on all firewalls.
39

40 Labels And Coding:

41 All electrical BAS cable used in the facilities shall be fire rated for plenum usage. Each electrical
42 field wire shall be labeled or coded at each end to show location of the opposite end. Each
43 point of all field terminal strips shall be permanently labeled or coded to show the instrument or
44 item served. Color coded cable with cable diagrams may be used to accomplish cable
45 identification and terminal strip identification.
46

47 Application Programs:

48 The Central Host Computer is currently capable of creating programs that will meet all needs of
49 this project. The system software can either through pre-constructed on board programs or
through the use of the flexible operator generated language using Industrial Process Control

1 Language (IPCL) to achieve automated, operator independent control of facility sub-system.

2
3 CALCULATIONS: The system shall automatically perform predefined calculations based
4 on operator input, real time data and required consultants. Calculations shall include,
5 but not be limited to, the following:
6

7 Electrical Power (KW) and (KWH) - Calculate electrical power based on voltage
8 and amperage, or on pulse meter input.
9

10 Flow Rate (CFM), (GPM), (CCF), etc. - Based either on data obtained by Sub
11 Metering devices or other acceptable standard method.
12

13 Additional/Subtraction - Add or subtract a number of real values to obtain a
14 virtual value.
15

16 Boolean Logic and Math - complete and, if, greatest of, least of, greater than,
17 etc., and all math command sets.
18

19 Temperature reporting and logging.
20

21 Operators Input:

22 All parameters shall be input through the operator's terminal or Host Computer.
23 The operator shall be able to determine the time increment for performing
24 calculations. The operator shall input the value of required constants.
25 Calculated points shall be defined through the operator's terminal either locally
26 of by the use of the Host terminal. All commands will be in English language and
27 in a form determined by the Operator.
28

29 Control Programs:

30 The Host Computer and local control terminal shall be capable of changing any
31 set point and override of the Master Controller control logic. The following
32 minimum application programs will be provided in each Master controller.
33

- 34 Program Inputs Authority
- 35 Command Priorities
- 36 Analog Commands
- 37 Alarms
- 38 Calculated Point
- 39 Analog Monitoring
- 40 Analog Totals
- 41 Energy Totals
- 42 Reports generated at a specific trouble or alarm
- 43 Predictor Corrective Software
- 44 Time Programs
- 45 Event Programs
- 46 Scheduled Start/Stop Program
- 47 Optimized Start/Stop Program
- 48 Duty Cycling Program
- 49 Demand Limiting Program (with On/Off peak control)

- 1 Day/Night Setback Program
- 2 Economizer Program
- 3 Hot Water Heat Exchanger Optimization Program
- 4 Hot Water/Outside Air Reset Program
- 5 Chiller Organization Program
- 6 Chiller Demand Limit Program
- 7 Full DDC (Direct Digital Control)
- 8 Full PID (Proportional-Integral-Derivative) Control Loop

9 Host Color Graphic Crt Display:

10 The BAS Contractor shall add all necessary graphics to the Host CPU that will display real time
 11 data generated by system. The following minimum data will be displayed on a graphic picture
 12 for each system:

- 13 Outside air temperature.
- 14 Heating and cooling mode
- 15 Chiller (Water Cooled) status, step or VFD controller, supply and return temperature
 16 from the chilled water loop. and supply and return temperature from the cooling tower
 17 loop
- 18 Cooling Tower fan and pump status, supply and return temperature from the heat
 19 exchanger, and supply and return temperature to heat pump condenser loop from heat
 20 exchanger
- 21 Boiler, step controller and pump status, and return temperature from the boiler to heat
 22 pump condenser loop.
- 23 Hot or Chilled Water Pump loop water supply and return water temperatures.
- 24 Hot or Chilled Water Pump Loop circulation pumps start/stop, status and VFD control.
- 25 Heat Pump loop water supply and return water temperatures.
- 26 Heat Pump Loop circulation pumps start/stop, status and VFD control.
- 27 Start/stop/status of building HVAC fans.
- 28 Electrical consumption (KWH) and demand (kW) of building.
- 29 All HVAC return air, mixed air, supply air temperatures.
- 30 Control status of intake air damper, mixed air dampers, and relief air dampers and heat
 31 pump flow control valves.
- 32 Indication of each heat pumps, window closure, and room lighting control strategy and
 33 operation, showing current space and discharge temperature, lighting status and all set
 34 points.
- 35 Indication of each fan coil or unit ventilator control strategy and operation, showing
 36 current space and discharge temperature, fan status and all set points.
- 37 Indication of each lighting control strategy and operation, showing current
 38 On/Off/Over-ride status, space occupancy and light level status and all set
 39 points.
- 40 Incident solar radiation (W/m²) and electrical generation (KW) instantaneous,
 41 generation efficiency and cumulative generation (KWH per day, month, year) for
 42 Solar PV system. Stand alone display system in Lobby of school.

43
 44 Operational Tests And Training:

45 This work shall include field testing, and adjustment of major sub-systems and of the complete
 46 operational system, with an on-site operational acceptance test of the completed operating
 47 system. The Owner shall be advised at least four (4) days in advance of all tests and may attend
 48 at their discretion. Acceptance of tests for the Owner shall not relieve the Contractor of
 49 responsibility for the completed system meeting all requirements of these specifications.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48

All equipment must be calibrated and checked before the system test is started. All equipment shall be placed on line and shall be certified prior to the final Operational Acceptance Test.

Final operational test of not less than five (5) consecutive days and shall be conducted to demonstrate that all equipment is functioning properly in accordance with this specification. The correct operation of all monitored and controlled points shall be demonstrated as well as the operation capabilities of sequence, reports, specialized control algorithms, diagnostics, and all other software.

If equipment operates at an average effectiveness level (AEL) of 98% during the performance test period of five (5) calendar days, it will be deemed to have met the specifications standard of performance and final acceptance of the system shall be made provided the Contractor has satisfied all other requirements of this specification

The average effectiveness level is defined as the ratio between the total days the equipment is on-line for the five-day test period, less any system days of downtime accumulated within that period, divided by the test period and the thirty-day test period. Downtime shall result whenever the BAS system is unable to fulfill all required functions detailed within this specification due any malfunction of either hardware or software. Any defective hardware or software shall be corrected when it occurs before the test may be resumed. System downtime for each incident shall be measured by those intervals during the performance period between the time that the Contractor is notified of equipment failure and the time that the system is returned to proper operating condition. Downtime of the system resulting from the following causes will not be considered as system failures:

Downtime resulting from an outage of the main power supply in excess of the capability of any backup power source(s), provided that the automatic initiation of all backup sources was accomplished and fulfills the requirements of this specification.

Failure of a communications link, provided that the DCU Processor automatically and correctly operates in the stand-alone mode and provided that the failure was not due to a failure of Contractor furnished equipment.

Downtime resulting from the failure of existing equipment.

A functional failure resulting from an individual sensor or controller provided.

The Contractor shall provide one formal training session of four hours for two of the Owner's personnel in the operation of the BAS System. This is in addition to the necessary on-site training to allow operating personnel to become familiar with the BAS and be able to locate normal types of trouble and understand the operation of the system

END OF SECTION

1 SECTION 231123 - FACILITY NATURAL-GAS PIPING

2
3 GENERAL

4
5 RELATED DOCUMENTS

6 Drawings and general provisions of the Contract, including General and Supplementary
7 Conditions and Division 01 Specification Sections, apply to this Section.

8
9 SUMMARY

10 Section Includes:

- 11 Pipes, tubes, and fittings.
- 12 Piping specialties.
- 13 Piping and tubing joining materials.
- 14 Valves.
- 15 Pressure regulators.

16
17 DEFINITIONS

18 Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces,
19 pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings,
20 unexcavated spaces, crawlspaces, and tunnels.

21 Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied
22 spaces and mechanical equipment rooms.

23 Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient
24 temperatures and weather conditions. Examples include rooftop locations.

25
26 PERFORMANCE REQUIREMENTS

27 Minimum Operating-Pressure Ratings:

28 Piping and Valves: 100 psig minimum unless otherwise indicated.

29 Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more
30 than 2 psig but not more than 5 psig and is reduced to secondary pressure of more than 0.5 psig
31 but not more than 2 psig.

32 Delegated Design: Design restraints and anchors for natural-gas piping and equipment,
33 including comprehensive engineering analysis by a qualified professional engineer, using
34 performance requirements and design criteria indicated.

35
36 SUBMITTALS

37 Product Data: For each type of the following:

38 Piping specialties.

39 Corrugated, stainless-steel tubing with associated components.

40 Valves. Include pressure rating, capacity, settings, and electrical connection data of
41 selected models.

42 Pressure regulators. Indicate pressure ratings and capacities.

43 Dielectric fittings.

44 Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and
45 elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple
46 pipes, alignment guides, expansion joints and loops, and attachments of the same to building
47 structure. Detail location of anchors, alignment guides, and expansion joints and loops.

48 Shop Drawing Scale: 1/8 inch per foot.

1 Detail mounting, supports, and valve arrangements for pressure regulator assembly.
2 Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with
3 performance requirements and design criteria, including analysis data signed and sealed by the
4 qualified professional engineer responsible for their preparation.

5 Detail fabrication and assembly of expansion compensation.

6 Design Calculations: Calculate requirements for selecting expansion compensation.

7 Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown
8 and coordinated with other installations, using input from installers of the items involved.

9 Operation and Maintenance Data: For pressure regulators to include in emergency, operation,
10 and maintenance manuals.

11 12 QUALITY ASSURANCE

13 Steel Support Welding Qualifications: Qualify procedures and personnel according to
14 AWS D1.1/D1.1M, "Structural Welding Code - Steel."

15 Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and
16 Pressure Vessel Code.

17 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a
18 qualified testing agency, and marked for intended location and application.

19 20 DELIVERY, STORAGE, AND HANDLING

21 Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping
22 according to requirements of authorities having jurisdiction.

23 Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping,
24 storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and
25 moisture.

26 Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging
27 coating, and protect from direct sunlight.

28 Protect stored PE pipes and valves from direct sunlight.

29 30 PROJECT CONDITIONS

31 Perform site survey, research public utility records, and verify existing utility locations. Contact
32 utility-locating service for area where Project is located.

33 Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities
34 occupied by Owner or others unless permitted under the following conditions and then only
35 after arranging to provide purging and startup of natural-gas supply according to requirements
36 indicated:

37 Notify Construction Manager of pending interruption of natural gas service.

38 Provide no fewer than two days in advance of proposed interruption of natural-gas
39 service.

40 Do not proceed with interruption of natural-gas service without Construction Manager's
41 written permission.

42 43 COORDINATION

44 Coordinate sizes and locations of concrete bases with actual equipment provided.

45 Coordinate requirements for access panels and doors for valves installed concealed behind
46 finished surfaces. Comply with requirements in Division 08 Section "Access Doors and Frames."

1
2 **PRODUCTS**

3
4 **PIPES, TUBES, AND FITTINGS**

5 Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

6 Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

7 Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket
8 welding.

9 Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint,
10 and threaded ends.

11 Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including
12 bolts, nuts, and gaskets of the following material group, end connections, and facings:

13
14 Material Group: 1.1.

15 End Connections: Threaded or butt welding to match pipe.

16 Lapped Face: Not permitted underground.

17 Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings,
18 and spiral-wound metal gaskets.

19 Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel
20 underground.

21 Protective Coating for Underground Piping: Factory-applied, three-layer coating of
22 epoxy, adhesive, and PE.

23 Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

24 Mechanical Couplings:

25 Manufacturers: Subject to compliance with requirements, provide products by
26 one of the following:

27 Dresser Piping Specialties; Division of Dresser, Inc.

28 Smith-Blair, Inc.

29 Steel flanges and tube with epoxy finish.

30 Buna-nitrile seals.

31 Steel bolts, washers, and nuts.

32 Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or
33 steel pipe to steel pipe.

34 Steel body couplings installed underground on plastic pipe shall be factory
35 equipped with anode.

36 Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.

37 Manufacturers: Subject to compliance with requirements, provide products by one of
38 the following:

39 OmegaFlex, Inc.

40 Parker Hannifin Corporation; Parflex Division.

41 Titeflex.

42 Tru-Flex Metal Hose Corp.

43
44 Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.

45 Coating: PE with flame retardant.

46 Surface-Burning Characteristics: As determined by testing identical products
47 according to ASTM E 84 by a qualified testing agency. Identify products with
48 appropriate markings of applicable testing agency.

1
2 Flame-Spread Index: 25 or less.
3 Smoke-Developed Index: 50 or less.
4 Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with
5 corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets.
6 Include brazing socket or threaded ends complying with ASME B1.20.1.
7 Striker Plates: Steel, designed to protect tubing from penetrations.
8 Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded
9 connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing
10 outlets.
11 Operating-Pressure Rating: 5 psig.
12 PE Pipe: ASTM D 2513, SDR 11.
13 PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with
14 dimensions matching PE pipe.
15 PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with
16 ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel,
17 Schedule 40, Type E or S, Grade B.
18 Anodeless Service-Line Risers: Factory fabricated and leak tested.
19 Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
20 Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel,
21 Type E or S, Grade B, with corrosion-protective coating covering. Vent casing
22 aboveground.
23 Aboveground Portion: PE transition fitting.
24 Outlet shall be threaded or flanged or suitable for welded connection.
25 Tracer wire connection.
26 Ultraviolet shield.
27 Stake supports with factory finish to match steel pipe casing or carrier pipe.
28 Transition Service-Line Risers: Factory fabricated and leak tested.
29 Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet
30 connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E
31 or S, Grade B, with corrosion-protective coating for aboveground outlet.
32 Outlet shall be threaded or flanged or suitable for welded connection.
33 Bridging sleeve over mechanical coupling.
34 Factory-connected anode.
35 Tracer wire connection.
36 Ultraviolet shield.
37 Stake supports with factory finish to match steel pipe casing or carrier pipe.
38 Plastic Mechanical Couplings, NPS 1-1/2 and Smaller: Capable of joining PE pipe to PE
39 pipe.
40 Manufacturers: Subject to compliance with requirements, provide products by
41 one of the following:
42 Lyall, R. W. & Company, Inc.
43 Mueller Co.; Gas Products Div.
44 Perfection Corporation; a subsidiary of American Meter Company.
45 PE body with molded-in, stainless-steel support ring.
46 Buna-nitrile seals.
47 Acetal collets.
48 Electro-zinc-plated steel stiffener.

1 Plastic Mechanical Couplings, NPS 2 and Larger: Capable of joining PE pipe to PE pipe,
2 steel pipe to PE pipe, or steel pipe to steel pipe.

3 Manufacturers: Subject to compliance with requirements, provide products by
4 one of the following:

5 Lyall, R. W. & Company, Inc.

6 Mueller Co.; Gas Products Div.

7 Perfection Corporation; a subsidiary of American Meter Company.

8 Fiber-reinforced plastic body.

9 PE body tube.

10 Buna-nitrile seals.

11 Acetal collets.

12 Stainless-steel bolts, nuts, and washers.

13 Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe
14 to PE pipe, or steel pipe to steel pipe.

15 Manufacturers: Subject to compliance with requirements, provide products by
16 one of the following:

17 Dresser Piping Specialties; Division of Dresser, Inc.

18 Smith-Blair, Inc.

19 Stainless-steel flanges and tube with epoxy finish.

20 Buna-nitrile seals.

21 Stainless-steel bolts, washers, and nuts.

22 Factory-installed anode for steel-body couplings installed underground.

23 PIPING SPECIALTIES

24 Appliance Flexible Connectors:

25 Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.

26 Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.

27 Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.

28 Corrugated stainless-steel tubing with polymer coating.

29 Operating-Pressure Rating: 0.5 psig.

30 End Fittings: Zinc-coated steel.

31 Threaded Ends: Comply with ASME B1.20.1.

32 Maximum Length: 36 inches.

33 Y-Pattern Strainers:

34 Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.

35 End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and
36 larger.

37 Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50
38 percent free area.

39 CWP Rating: 125 psig.

40 Basket Strainers:

41 Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain
42 connection.

43 End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and
44 larger.

45 Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50
46 percent free area.

47 CWP Rating: 125 psig.

48 T-Pattern Strainers:

- 1 Body: Ductile or malleable iron with removable access coupling and end cap for strainer
 2 maintenance.
 3 End Connections: Grooved ends.
 4 Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 57
 5 percent free area.
 6 CWP Rating: 750 psig.
 7 Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire
 8 screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end
 9 connection.

10

11 JOINING MATERIALS

- 12 Joint Compound and Tape: Suitable for natural gas.
 13 Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for
 14 wall thickness and chemical analysis of steel pipe being welded.

15

16 MANUAL GAS SHUTOFF VALVES

- 17 See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff
 18 Valve Schedule" Articles for where each valve type is applied in various services.
 19 General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
 20 CWP Rating: 125 psig.
 21 Threaded Ends: Comply with ASME B1.20.1.
 22 Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 23 Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas
 24 Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule"
 25 Articles.
 26 Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for
 27 valves 1 inch and smaller.
 28 Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently
 29 marked on valve body.
 30 General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
 31 CWP Rating: 125 psig.
 32 Flanged Ends: Comply with ASME B16.5 for steel flanges.
 33 Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas
 34 Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule"
 35 Articles.
 36 Service Mark: Initials "WOG" shall be permanently marked on valve body.
 37 PE Ball Valves: Comply with ASME B16.40.
 38 Manufacturers: Subject to compliance with requirements, provide products by one of
 39 the following:
 40 Kerotest Manufacturing Corp.
 41 Lyall, R. W. & Company, Inc.
 42 Perfection Corporation; a subsidiary of American Meter Company.
 43 Body: PE.
 44 Ball: PE.
 45 Stem: Acetal.
 46 Seats and Seals: Nitrile.
 47 Ends: Plain or fusible to match piping.
 48 CWP Rating: 80 psig.

1 Operating Temperature: Minus 20 to plus 140 deg F .
 2 Operator: Nut or flat head for key operation.
 3 Include plastic valve extension.
 4 Include tamperproof locking feature for valves where indicated on Drawings.

5 **Valve Boxes:**

6 Cast-iron, two-section box.
 7 Top section with cover with "GAS" lettering.
 8 Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
 9 Adjustable cast-iron extensions of length required for depth of bury.
 10 Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head,
 11 and with stem of length required to operate valve.

12
 13 **PRESSURE REGULATORS**

14 **General Requirements:**

15 Single stage and suitable for natural gas.
 16 Steel jacket and corrosion-resistant components.
 17 Elevation compensator.
 18 End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators
 19 NPS 2-1/2 and larger.

20 **Line Pressure Regulators: Comply with ANSI Z21.80.**

21 **Manufacturers: Subject to compliance with requirements, provide products by one of**
 22 **the following:**

23 Actaris.
 24 American Meter Company.
 25 Eclipse Combustion, Inc.
 26 Fisher Control Valves and Regulators; Division of Emerson Process Management.
 27 Invensys.
 28 Maxitrol Company.
 29 Richards Industries; Jordan Valve Div.

30 **Body and Diaphragm Case: Cast iron or die-cast aluminum.**

31 **Springs: Zinc-plated steel; interchangeable.**

32 **Diaphragm Plate: Zinc-plated steel.**

33 **Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the**
 34 **valve port.**

35 **Orifice: Aluminum; interchangeable.**

36 **Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.**

37 **Single-port, self-contained regulator with orifice no larger than required at maximum**
 38 **pressure inlet, and no pressure sensing piping external to the regulator.**

39 **Pressure regulator shall maintain discharge pressure setting downstream, and not**
 40 **exceed 150 percent of design discharge pressure at shutoff.**

41 **Overpressure Protection Device: Factory mounted on pressure regulator.**

42 **Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not**
 43 **connected to vent piping.**

44 **Appliance Pressure Regulators: Comply with ANSI Z21.18.**

45 **Manufacturers: Subject to compliance with requirements, provide products by one of**
 46 **the following:**

47 Canadian Meter Company Inc.
 48 Eaton Corporation; Controls Div.

1 Harper Wyman Co.
 2 Maxitrol Company.
 3 SCP, Inc.
 4 Body and Diaphragm Case: Die-cast aluminum.
 5 Springs: Zinc-plated steel; interchangeable.
 6 Diaphragm Plate: Zinc-plated steel.
 7 Seat Disc: Nitrile rubber.
 8 Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 9 Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
 10 Regulator may include vent limiting device, instead of vent connection, if approved by
 11 authorities having jurisdiction.
 12

13 LABELING AND IDENTIFYING

14 Identify piping, valves and equipment in accordance with Section 220553 "Identification for
 15 plumbing Systems."
 16 Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for
 17 marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick,
 18 continuously inscribed with a description of utility, with metallic core encased in a protective
 19 jacket for corrosion protection, detectable by metal detector when tape is buried up to 30
 20 inches deep; colored yellow.
 21

22 EXECUTION

23
24 EXAMINATION

25 Examine roughing-in for natural-gas piping system to verify actual locations of piping
 26 connections before equipment installation.
 27 Proceed with installation only after unsatisfactory conditions have been corrected.
 28

29 PREPARATION

30 Close equipment shutoff valves before turning off natural gas to premises or piping section.
 31 Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to
 32 determine that natural-gas utilization devices are turned off in piping section affected.
 33 Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of
 34 accidental ignition.
 35

36 OUTDOOR UNDERGROUND PIPING INSTALLATION

37 Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of
 38 natural-gas piping.
 39 Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply
 40 with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and
 41 backfilling.
 42 If natural-gas piping is installed less than 36 inches below finished grade, install it in
 43 containment conduit.
 44 Install underground, PE, natural-gas piping according to ASTM D 2774.
 45 Steel Piping with Protective Coating:
 46 Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 47 Repair damage to PE coating on pipe as recommended in writing by protective coating
 48 manufacturer.

1 Replace pipe having damaged PE coating with new pipe.
 2 Install fittings for changes in direction and branch connections.
 3 Install pressure gage upstream and downstream from each service regulator. Pressure gages
 4 are specified in Division 23 Section "Meters and Gages for HVAC Piping."
 5

6 INDOOR PIPING INSTALLATION

7 Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of
 8 natural-gas piping.
 9 Drawing plans, schematics, and diagrams indicate general location and arrangement of piping
 10 systems. Indicated locations and arrangements are used to size pipe and calculate friction loss,
 11 expansion, and other design considerations. Install piping as indicated unless deviations to
 12 layout are approved on Coordination Drawings.
 13 Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during
 14 progress of construction, to allow for mechanical installations.
 15 Install piping in concealed locations unless otherwise indicated and except in equipment rooms
 16 and service areas.
 17 Install piping indicated to be exposed and piping in equipment rooms and service areas at right
 18 angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated
 19 otherwise.
 20 Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
 21 Locate valves for easy access.
 22 Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
 23 Install piping free of sags and bends.
 24 Install fittings for changes in direction and branch connections.
 25 Verify final equipment locations for roughing-in.
 26 Comply with requirements in Sections specifying gas-fired appliances and equipment for
 27 roughing-in requirements.
 28 Drips and Sediment Traps: Install drips at points where condensate may collect, including
 29 service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install
 30 where condensate is subject to freezing.
 31 Construct drips and sediment traps using tee fitting with bottom outlet plugged or
 32 capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches
 33 long and same size as connected pipe. Install with space below bottom of drip to
 34 remove plug or cap.
 35 Extend relief vent connections for service regulators, line regulators, and overpressure
 36 protection devices to outdoors and terminate with weatherproof vent cap.
 37 Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or
 38 floors, and in floor channels unless indicated to be exposed to view.
 39 Concealed Location Installations: Except as specified below, install concealed natural-gas piping
 40 and piping installed under the building in containment conduit constructed of steel pipe with
 41 welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors
 42 and terminate with weatherproof vent cap.
 43 Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be
 44 installed in accessible spaces without containment conduit.
 45 In Floors: Install natural-gas piping with welded or brazed joints and protective coating
 46 in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum
 47 of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic

1 structures such as reinforcing rods or electrically neutral conductors. Do not embed
2 piping in concrete slabs containing quick-set additives or cinder aggregate.

3 In Floor Channels: Install natural-gas piping in floor channels. Channels must have
4 cover and be open to space above cover for ventilation.

5 In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from
6 physical damage using steel striker barriers at rigid supports.

7 Exception: Tubing passing through partitions or walls does not require striker
8 barriers.

9 Prohibited Locations:

10 Do not install natural-gas piping in or through circulating air ducts, clothes or
11 trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or
12 elevator shafts.

13 Do not install natural-gas piping in solid walls or partitions.

14 Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side
15 down.

16 Connect branch piping from top or side of horizontal piping.

17 Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each
18 piece of equipment. Unions are not required at flanged connections.

19 Do not use natural-gas piping as grounding electrode.

20 Install strainer on inlet of each line-pressure regulator and automatic or electrically operated
21 valve.

22 Install pressure gage upstream and downstream from each line regulator. Pressure gages are
23 specified in Division 23 Section "Meters and Gages for HVAC Piping."

24 VALVE INSTALLATION

25 Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel
26 tubing, aluminum, or copper connector.

27 Install underground valves with valve boxes.

28 Install regulators and overpressure protection devices with maintenance access space adequate
29 for servicing and testing.

30 Install earthquake valves aboveground outside buildings according to listing.

31 Install anode for metallic valves in underground PE piping.

32 PIPING JOINT CONSTRUCTION

33 Ream ends of pipes and tubes and remove burrs.

34 Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

35 Threaded Joints:

36 Thread pipe with tapered pipe threads complying with ASME B1.20.1.

37 Cut threads full and clean using sharp dies.

38 Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.

39 Apply appropriate tape or thread compound to external pipe threads unless dryseal
40 threading is specified.

41 Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or
42 damaged. Do not use pipe sections that have cracked or open welds.

43 Welded Joints:

44 Construct joints according to AWS D10.12/D10.12M, using qualified processes and
45 welding operators.

46 Bevel plain ends of steel pipe.

- 1 Patch factory-applied protective coating as recommended by manufacturer at field
 2 welds and where damage to coating occurs during construction.
 3 Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas
 4 service. Install gasket concentrically positioned.
 5 Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare
 6 dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not
 7 overtighten.
 8 PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper
 9 towels. Join according to ASTM D 2657.
 10 Plain-End Pipe and Fittings: Use butt fusion.
 11 Plain-End Pipe and Socket Fittings: Use socket fusion.
 12

13 CONNECTIONS

- 14 Connect to utility's gas main according to utility's procedures and requirements.
 15 Install natural-gas piping electrically continuous, and bonded to gas appliance equipment
 16 grounding conductor of the circuit powering the appliance according to NFPA 70.
 17 Install piping adjacent to appliances to allow service and maintenance of appliances.
 18 Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72
 19 inches of each gas-fired appliance and equipment. Install union between valve and appliances
 20 or equipment.
 21 Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as
 22 practical to inlet of each appliance.
 23

24 LABELING AND IDENTIFYING

- 25 Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment"
 26 for piping and valve identification.
 27 Install detectable warning tape directly above gas piping, 12 inches below finished grade, except
 28 6 inches below subgrade under pavements and slabs.
 29

30 PAINTING

- 31 Comply with requirements in Division 09 painting Sections for painting interior and exterior
 32 natural-gas piping.
 33 Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars,
 34 earthquake valves, and piping specialties, except components, with factory-applied paint or
 35 protective coating.
 36 Alkyd System: MPI EXT 5.1D.
 37 Prime Coat: Alkyd anticorrosive metal primer.
 38 Intermediate Coat: Exterior alkyd enamel matching topcoat.
 39 Topcoat: Exterior alkyd enamel (flat).
 40 Color: yellow.
 41 Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars,
 42 earthquake valves, and piping specialties, except components, with factory-applied paint or
 43 protective coating.
 44 Latex Over Alkyd Primer System: MPI INT 5.1Q.
 45 Prime Coat: Alkyd anticorrosive metal primer.
 46 Intermediate Coat: Interior latex matching topcoat.
 47 Topcoat: Interior latex (flat).
 48 Color: yellow.

1 Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and
2 by procedures to match original factory finish.

3
4 FIELD QUALITY CONTROL

5 Perform tests and inspections.

6 Tests and Inspections:

7 Test, inspect, and purge natural gas according to NFPA 54, the International Fuel Gas
8 Code and authorities having jurisdiction.

9 Natural-gas piping will be considered defective if it does not pass tests and inspections.
10 Prepare test and inspection reports.

11
12 DEMONSTRATION

13 Engage a factory-authorized service representative to train Owner's maintenance personnel to
14 adjust, operate, and maintain earthquake valves.

15
16 OUTDOOR PIPING SCHEDULE

17 Underground or above grade temporary natural-gas piping shall be the following:

18 PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers
19 with tracer wire terminated in an accessible location.

20 Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat
21 pipe and fittings with protective coating for steel piping.

22 Aboveground natural-gas piping shall be the following:

23 Steel pipe with malleable-iron fittings and threaded joints.

24 Steel pipe with wrought-steel fittings and welded joints.

25 Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and
26 fittings with protective coating for steel piping.

27
28 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG

29 Aboveground, branch piping NPS 1 and smaller shall be the following:

30 Corrugated stainless-steel tubing with mechanical fittings having socket or threaded
31 ends to match adjacent piping.

32 Steel pipe with malleable-iron fittings and threaded joints.

33 Aboveground, distribution piping shall be the following:

34 NPS 2 and smaller:

35 Corrugated stainless-steel tubing with mechanical fittings having socket or
36 threaded ends to match adjacent piping.

37 Steel pipe with malleable-iron fittings and threaded joints.

38 NPS 2-1/2 and larger:

39 Steel pipe with malleable-iron fittings and threaded joints.

40 Underground, below building, piping shall be the following:

41 Steel pipe with wrought-steel fittings and welded joints.

42 Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat
43 underground pipe and fittings with protective coating for steel piping.

44 Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or
45 wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective
46 coating for steel piping.

- 1
2 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 5 PSIG.
3 Aboveground Piping: Maximum operating pressure more than 5 psig .
4 Aboveground, Branch Piping: Steel pipe with steel welding fittings and welded joints.
5 Aboveground, distribution piping shall be the following:
6 Steel pipe with steel welding fittings and welded joints.
7 Underground, below building, piping shall be the following:
8 Steel pipe with wrought-steel fittings and welded joints.
9 Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and
10 fittings with protective coating for steel piping.
11 Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or
12 wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective
13 coating for steel piping.
14
15 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE
16 Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's
17 gas mains and listed by an NRTL.
18 Underground:
19 PE valves.
20 NPS 2 and Smaller: Bronze plug valves.
21 NPS 2-1/2 and Larger: Cast-iron, nonlubricated plug valves.
22
23 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE
24 Valves for pipe sizes NPS 2 and smaller at service meter shall be the following:
25 Two-piece, full-port, bronze ball valves with bronze trim.
26 Bronze plug valve.
27 Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be the following:
28 Bronze plug valve.
29 Cast-iron, nonlubricated plug valve.
30 Distribution piping valves for pipe sizes NPS 2 and smaller shall be the following:
31 Two-piece, full-port, bronze ball valves with bronze trim.
32 Bronze plug valve.
33 Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be the following:
34 Two-piece, full-port, bronze ball valves with bronze trim.
35 Bronze plug valve.
36 Cast-iron, lubricated plug valve.
37 Valves in branch piping for single appliance shall be the following:
38 Two-piece, full-port, bronze ball valves with bronze trim.
39
40 END OF SECTION

1 SECTION 23 2113 - HYDRONIC PIPING

2
3 GENERAL

4
5 Related Documents

6 Drawings and general provisions of the Contract, including General and Supplementary Conditions and
7 Division 01 Specification Sections, apply to this Section.

8
9 Summary

10 This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for
11 the following:

- 12 Hot-water heating piping.
- 13 Chilled-water piping.
- 14 Makeup-water piping.
- 15 Condensate-drain piping.

16
17 Submittals

18 Product Data: For each type of the following:

- 19 Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-
- 20 orifice balancing valves and automatic flow-control valves.
- 21 Chemical treatment.
- 22 Hydronic specialties.

23 Shop Drawings: Detail, at 1/4 scale, the piping layout, fabrication of pipe anchors, hangers, supports for
24 multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building
25 structure. Detail location of anchors, alignment guides, and expansion joints and loops.

26 Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

27
28 Quality Assurance

29 ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and
30 installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and
31 stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code:
32 Section VIII, Division 01.

33
34 Extra Materials

35 Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive
36 maintenance for one year from date of Substantial Completion.

37 Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include
38 flowmeter, probes, hoses, flow charts, and carrying case.

39
40 PRODUCTS

41
42 Copper Tube And Fittings

43 Drawn-Temper Copper Tubing: ASTM B 88, Type L.

44 Annealed-Temper Copper Tubing: ASTM B 88, Type K.

45 Wrought-Copper Fittings: ASME B16.22.

46 Manufacturers: Subject to compliance with requirements, provide products by one of the
47 following:

- 48 Anvil International, Inc.
- 49 S. P. Fittings; a division of Star Pipe Products.
- 50 Victaulic Company of America.

51
52 Steel Pipe And Fittings

53 Steel Pipe: ASTM A 53/A 53M, black steel with plain ends, Schedule 40.

1 Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
 2 Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and
 3 gaskets of the following material group, end connections, and facings:

4 Material Group: 1.1.

5 End Connections: Butt welding.

6 Facings: Raised face.

7 Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are
 8 installed.

9 10 Joining Materials

11 Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 12 ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or
 13 specific material is indicated.

14 Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

15 Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

16 Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

17 Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

18 Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or
 19 BAg-1, silver alloy for joining copper with bronze or steel.

20 Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall
 21 thickness and chemical analysis of steel pipe being welded.

22 Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures
 23 and pressures.

24 25 Transition Fittings

26 Plastic-to-Metal Transition Fittings:

27 Manufacturers: Subject to compliance with requirements, provide products by one of the
 28 following:

29 Charlotte Pipe and Foundry Company.

30 IPEX Inc.

31 KBI.

32 Plastic-to-Metal Transition Unions:

33 Manufacturers: Subject to compliance with requirements, provide products by one of the
 34 following:

35 Charlotte Pipe and Foundry Company.

36 IPEX Inc.

37 KBI.

38 NIBCO INC.

39 Dielectric Fittings

40 Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain,
 41 or weld-neck end connections that match piping system materials.

42 Insulating Material: Suitable for system fluid, pressure, and temperature.

43 Dielectric Unions:

44 Manufacturers: Subject to compliance with requirements, provide products by one of the
 45 following:

46 Capitol Manufacturing Company.

47 Central Plastics Company.

48 Hart Industries International, Inc.

49 Watts Regulator Co.; a division of Watts Water Technologies, Inc.

50 Zurn Plumbing Products Group; AquaSpec Commercial Products Division.

51 Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

52 Dielectric Flanges:

1 Manufacturers: Subject to compliance with requirements, provide products by one of the
2 following:

3 Capitol Manufacturing Company.

4 Central Plastics Company.

5 Watts Regulator Co.; a division of Watts Water Technologies, Inc.

6 Factory-fabricated companion-flange assembly, for 300-psig minimum working pressure as
7 required to suit system pressures.

8 **Dielectric-Flange KIts:**

9 Manufacturers: Subject to compliance with requirements, provide products by one of the
10 following:

11 Advance Products & Systems, Inc.

12 Calpico, Inc.

13 Central Plastics Company.

14 Pipeline Seal and Insulator, Inc.

15 Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene
16 or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing
17 washers.

18 Separate companion flanges and steel bolts and nuts shall have 300-psig minimum working
19 pressure where required to suit system pressures.

20 **Dielectric Couplings:**

21 Manufacturers: Subject to compliance with requirements, provide products by one of the
22 following:

23 Calpico, Inc.

24 Lochinvar Corporation.

25 Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and
26 300-psig minimum working pressure at 225 deg F.

27 **Dielectric Nipples:**

28 Manufacturers: Subject to compliance with requirements, provide products by one of the
29 following:

30 Perfection Corporation; a subsidiary of American Meter Company.

31 Precision Plumbing Products, Inc.

32 Sioux Chief Manufacturing Company, Inc.

33 Victaulic Company of America.

34 Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or
35 grooved ends; and 300-psig minimum working pressure at 225 deg F.

36
37 **Valves**

38 **Bronze, Calibrated-Orifice, Balancing Valves:**

39 Manufacturers: Subject to compliance with requirements, provide products by one of the
40 following:

41 Armstrong Pumps, Inc.

42 Bell & Gossett Domestic Pump; a division of ITT Industries.

43 Tour & Andersson; available through Victaulic Company of America.

44 **Body:** Bronze, ball or plug type with calibrated orifice or venturi.

45 **Ball:** Brass or stainless steel.

46 **Plug:** Resin.

47 **Seat:** PTFE.

48 **End Connections:** Threaded or socket.

49 **Pressure Gage Connections:** Integral seals for portable differential pressure meter.

50 **Handle Style:** Lever, with memory stop to retain set position.

51 **CWP Rating:** Minimum 125 psig.

52 **Maximum Operating Temperature:** 250 deg F.

53 **Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:**

1 Manufacturers: Subject to compliance with requirements, provide products by one of the
 2 following:
 3 Armstrong Pumps, Inc.
 4 Bell & Gossett Domestic Pump; a division of ITT Industries.
 5 Tour & Andersson; available through Victaulic Company of America.
 6 Body: Cast-iron or steel body, ball, plug, or globe pattern with callbrated orifice or venturi.
 7 Ball: Brass or stainless steel.
 8 Stem Seals: EPDM O-rings.
 9 Disc: Glass and carbon-filled PTFE.
 10 Seat: PTFE.
 11 End Connections: Flanged or grooved.
 12 Pressure Gage Connections: Integral seals for portable differential pressure meter.
 13 Handle Style: Lever, with memory stop to retain set position.
 14 CWP Rating: Minimum 125 pslg.
 15 Maximum Operating Temperature: 250 deg F.

16 Automatic Flow-Control Valves:

17 Manufacturers: Subject to compliance with requirements, provide products by one of the
 18 following:
 19 Flow Design Inc.
 20 Griswold Controls.
 21 Hays
 22 Body: Brass or ferrous metal.
 23 Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.
 24 Combination Assemblles: Include bonze or brass-alloy ball valve.
 25 Identification Tag: Marked with zone identification, valve number, and flow rate.
 26 Size: Same as pipe ln which installed.
 27 Performance: Maintain constant flow, plus or minus 5 percent over system pressure
 28 fluctuations.
 29 Minimum CWP Rating: 175 psig.
 30 Maximum Operating Temperature: 250 deg F.

31
32 District Chilled Water Building Isolation Valves

33 Specification: Butterfly valves shall meet or exceed AWWA C504 standard. Approved valves include:
 34 K-Flo Model 504 – Flange x Flange
 35 DeZurik BAW – Flange x Flange
 36

37 Air Control Devices

38 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that
39 may be incorporated into the Work include, but are not limited to, the following:

40 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 41 Amtrol, Inc.
- 42 Armstrong Pumps, Inc.
- 43 Bell & Gossett Domestic Pump; a division of ITT Industries.
- 44 Taco.

45 Manual Air Vents:

- 46 Body: Bronze.
- 47 Internal Parts: Nonferrous.
- 48 Operator: Screwdriver or thumbscrew.
- 49 Inlet Connection: NPS 1/2.
- 50 Discharge Connection: NPS 1/8.
- 51 CWP Rating: 150 psig.
- 52 Maximum Operating Temperature: 225 deg F.

53 Automatic Air Vents:

1 Body: Bronze or cast iron.
 2 Internal Parts: Nonferrous.
 3 Operator: Noncorrosive metal float.
 4 Inlet Connection: NPS 1/2.
 5 Discharge Connection: NPS 1/4.
 6 CWP Rating: 150 psig.
 7 Maximum Operating Temperature: 240 deg F.

8 Diaphragm-Type Expansion Tanks:

9 Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating
 10 temperature. Factory test with taps fabricated and supports installed and labeled according to
 11 ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
 12 Diaphragm: Securely sealed into tank to separate air charge from system water to maintain
 13 required expansion capacity.
 14 Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

15 Tangential-Type Air Separators:

16 Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and
 17 375 deg F maximum operating temperature.
 18 Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion
 19 tank.
 20 Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections
 21 for NPS 2-1/2 and larger.
 22 Blowdown Connection: Threaded.
 23 Size: Match system flow capacity.

25 Chemical Treatment

26 Bypass Chemical Feeder: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill
 27 funnel and inlet, outlet, and drain valves.
 28 Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of
 29 scale and corrosion in piping and connected equipment.
 30 Propylene Glycol: Industrial grade with corrosion inhibitors and environmental-stabilizer additives for
 31 mixing with water in systems indicated to contain antifreeze or glycol solutions.

33 Hydronic Piping Specialties

34 Y-Pattern Strainers:

35 Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
 36 End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
 37 20 mesh 1/4" - 2", .04 perf, 2 1/2" - 3", .125 perf 4' - 6".
 38 Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent
 39 free area.
 40 CWP Rating: 125 psig.

41 Basket Strainers:

42 Body: ASTM A 126, Class B, high-tensile cast Iron with bolted cover and bottom drain
 43 connection.
 44 End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
 45 Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent
 46 free area.
 47 CWP Rating: 125 psig.

49 EXECUTION

51 Piping Applications

52 Hot-water heating piping, aboveground, NPS 2 and smaller, shall be the following:
 53 Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

- 1 Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be the following:
 2 Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange
 3 fittings, and welded and flanged joints.
- 4 Hot-water heating piping installed belowground and within slabs shall be the following:
 5 Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the
 6 fewest possible joints.
- 7 Chilled-water piping, aboveground, NPS 2 and smaller, shall be the following:
 8 Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
- 9 Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be the following:
 10 Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange
 11 fittings, and welded and flanged joints.
- 12 Condensate-Drain Piping Indoors: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and
 13 soldered joints.
- 14 Condensate-Drain Piping on Roof: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and
 15 soldered joints.
- 16 Air-Vent Piping:
 17 Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping
 18 systems according to the piping manufacturer's written instructions.
 19 Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
- 20 Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for
 21 piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for
 22 plastic piping systems according to the piping manufacturer's written instructions.

23

24 Valve Applications

- 25 Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each
 26 piece of equipment.
- 27 Install balancing valves at each branch connection to return main.
- 28 Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
- 29 Install check valves at each pump discharge and elsewhere as required to control flow direction.
- 30 Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure
 31 Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and
 32 pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure
 33 Vessel Code: Section VIII, Division 1, for installation requirements.
- 34 Install building isolation valves for district chilled inside mechanical room.
 35 Install isolation valves at pipe takeoff from 24" main.
 36 Valve Test – All buried valves shall be field tested to ensure valve works and has full
 37 operation from open to closed without any binding or blockage.

38

39 Piping Installations

- 40 Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 41 Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss,
 42 expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to
 43 layout are approved on Coordination Drawings.
- 44 Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and
 45 service areas.
- 46 Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or
 47 parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- 48 Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- 49 Install piping to permit valve servicing.
- 50 Install piping at indicated slopes.
- 51 Install piping free of sags and bends.
- 52 Install fittings for changes in direction and branch connections.
- 53 Install piping to allow application of insulation.

1 Select system components with pressure rating equal to or greater than system operating pressure.
 2 Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
 3 Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at
 4 low points in piping system mains and elsewhere as required for system drainage.
 5 Install piping at a uniform grade of 0.2 percent upward in direction of flow.
 6 Reduce pipe sizes using eccentric reducer fitting installed with level side up.
 7 Install branch connections to mains using tee fittings in main pipe, with the branch connected to the
 8 bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
 9 Install valves according to Division 23 Section "Valves."
 10 Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and
 11 elsewhere as indicated.
 12 Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as
 13 indicated.
 14 Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump,
 15 and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers
 16 NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

17 Tracer Wire:

18 All buried pipes shall have a new 16-gauge tracer wire buried with it.

19 Building Taps to Chilled Water Mains:

20 Taps - Connection to the existing pipes for a new building chilled water service can be made with
 21 a variety of fittings and methods. These include the following:

22 Flanged Tee Fittings – Cut pipe and fuse flange adapters to a new tee fitting. Not an
 23 easy method. Requires extra excavation and butt fusion below grade.

24 Hot Tap Tee Fitting – This method is often performed by the HDPE vendors in Denver
 25 since they have the proper equipment and more field experience. The fittings will
 26 include a temporary isolation valve that is usually not useful after the tap for at least
 27 one of the pipes because of the angle.

28 Squeeze/Pinch Off Method – This method is also best performed by the HDPE vendors
 29 or other specialized HDPE contractors. 12 inch and smaller pipe can be pinched closed
 30 on either side of the location for the new tee fitting. This allows a more conventional
 31 tee installation.

32 Bottom Taps Prohibited – Do not make taps off the bottom of the pipes, either the
 33 mains or any branches as this allows dirt and debris to move into the pipe.

34 Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23
 35 Section "Pipe Expansion Fittings and Loops."

36 Identify piping as specified in Division 23 Section "Mechanical Identification."
 37

38 Hangers And Supports

39 Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports." Comply
 40 with the following requirements for maximum spacing of supports.

41 Install the following pipe attachments:

42 Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.

43 Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.

44 Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a
 45 trapeze.

46 Spring hangers to support vertical runs.

47 Provide copper-clad hangers and supports for hangers and supports in direct contact with copper
 48 pipe.

49 On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching
 50 pipe.

51 Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

52 NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.

53 NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.

1 NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.

2 NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.

3 NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.

4 NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.

5 NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.

6 Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod
7 sizes:

8 NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.

9 NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.

10 NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.

11 NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.

12 Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

13 Pipe Joint Construction

14 Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping
15 systems.

16 Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

17 Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

18 Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end.

19 Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy
20 complying with ASTM B 32.

21 Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and
22 clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings
23 and valves as follows:

24 Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is
25 specified.

26 Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

27 Do not use pipe sections that have cracked or open welds.

28 Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and
29 welding operators according to Part 1 "Quality Assurance" Article.

30 Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install
31 gasket concentrically positioned. Use suitable lubricants on bolt threads.

32 Hydronic Specialties Installation

33 Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for
34 system air venting.

35 Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual
36 vents at heat-transfer coils and elsewhere as required for air venting.

37 Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward
38 slope toward tank.

39 Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve;
40 extend full size to nearest floor drain.

41 Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of
42 funnel not more than 48 inches above the floor. Install feeder in minimum NPS 3/4 bypass line, from
43 main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 pipe from
44 chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

45 Install tank fitting in tank and charge tank. Use manual vent for initial fill to establish proper water level in
46 tank.

47 Install tank fittings that are shipped loose.

48 Support tank from floor or structure above with sufficient strength to carry weight of tank, piping
49 connections, fittings, plus tank full of water. Do not overload building components and structural
50 members.

1 Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly
 2 charged with air to suit system Project requirements.
 3

4 Terminal Equipment Connections

5 Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
 6 Install control valves in accessible locations close to connected equipment.

7 Install bypass piping with globe valve around control valve. If parallel control valves are installed, only
 8 one bypass is required.

9 Install ports for pressure gages and thermometers at coil inlet and outlet connections according to
 10 Division 23 Section "Meters and Gages."
 11

12 Chemical Treatment

13 Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to
 14 keep system free of scale, corrosion, and fouling.

15 Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to
 16 remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain,
 17 clean strainer screens, and refill with fresh water.

18 Add initial chemical treatment and maintain water quality in ranges noted above for the first year of
 19 operation.

20 Fill systems indicated to have antifreeze or glycol solutions with the following concentrations:

21 Hot-Water Heating Piping: Minimum 30 percent propylene glycol.

22 Chilled-Water Piping: Minimum 30 percent propylene glycol.
 23

24 Field Quality Control

25 Prepare hydronic piping according to ASME B31.9 and as follows:

26 Leave joints, including welds, uninsulated and exposed for examination during test.

27 Provide temporary restraints for expansion joints that cannot sustain reactions due to test
 28 pressure. If temporary restraints are impractical, isolate expansion joints from testing.

29 Flush hydronic piping systems with clean water; then remove and clean or replace strainer
 30 screens.

31 Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be
 32 capable of sealing against test pressure without damage to valve. Install blinds in flanged joints
 33 to isolate equipment.

34 Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect
 35 against damage by expanding liquid or other source of overpressure during test.

36 Perform the following tests on hydronic piping:

37 Use ambient temperature water as a testing medium unless there is risk of damage due to
 38 freezing. Another liquid that is safe for workers and compatible with piping may be used.

39 While filling system, use vents installed at high points of system to release air. Use drains
 40 installed at low points for complete draining of test liquid.

41 Isolate expansion tanks and determine that hydronic system is full of water.

42 Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's
 43 working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve,
 44 or other component in system under test. Verify that stress due to pressure at bottom of vertical
 45 runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in
 46 Appendix A in ASME B31.9, "Building Services Piping."

47 After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints,
 48 and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components,
 49 and repeat hydrostatic test until there are no leaks.

50 Prepare written report of testing.

51 Clean Pipes:

52 The existing and new pipes shall be kept clean during storage and installation. Requirements
 53 include:

- 1 Deep Pits – The pits must be deep enough to permit water draining from pipes or other sources
2 to be below the openings of the DC connections at all times.
- 3 Pipe End Protection – The ends of existing and new exposed pipes shall be covered at all times
4 except when the work is active. This includes a cap on all pipes when dragged or pushed into
5 trenches.
- 6 Clean Equipment - All tools and pipe equipment used to cut pipes, connect pipes and handle
7 pipes must be clean.
- 8 Jet Pipes During Construction – Contractors can request assistance from Facilities Operations to
9 have HDPE pipes jetted with plumbing crews at no cost. Call Facilities Management Dispatch to
10 request cleaning.
- 11 Inspections - Pipe installations shall be visually inspected by the design engineer and District
12 Cooling staff before final connections are made to existing pipe mains and into buildings. Call
13 Facilities Management Dispatch at 491-0077 to request inspections.
- 14 Pressure Tests:
15 All new piping work shall be tested at 100 psig for two hours. Tests shall be witnessed by design
16 engineer or DC staff upon request by project manager.
- 17 Perform the following before operating the system:
18 Open manual valves fully.
19 Inspect pumps for proper rotation.
20 Set makeup pressure-reducing valves for required system pressure.
21 Inspect air vents at high points of system and determine if all are installed and operating freely
22 (automatic type), or bleed air completely (manual type).
23 Set temperature controls so all coils are calling for full flow.
24 Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling
25 towers, to specified values.
26 Verify lubrication of motors and bearings.
27
- 28 END OF SECTION

1 SECTION 23 22 15 - HVAC WATER TREATMENT

2
3 GENERAL

4
5 Summary

6
7 This Section includes the following HVAC water-treatment systems:

- 8 Bypass chemical-feed equipment and controls.
- 9 Chemical treatment test equipment.
- 10 HVAC water-treatment chemicals.

11
12 Performance Requirements

13 Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for
14 optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the
15 environment.

16 Base HVAC water treatment on quality of water available at Project site, HVAC system equipment
17 material characteristics and functional performance characteristics, operating personnel capabilities,
18 and requirements and guidelines of authorities having jurisdiction.

19 Closed hydronic systems, including hot-water heating and chilled water, shall have the following water
20 qualities:

- 21 pH: Maintain a value within 9.0 to 10.5.
- 22 "P" Alkalinity: Maintain a value within 100 to 500 ppm.
- 23 Boron: Maintain a value within 100 to 200 ppm.
- 24 Chemical Oxygen Demand: Maintain a maximum value of 100 ppm.
- 25 Soluble Copper: Maintain a maximum value of 0.20 ppm.
- 26 TDS: Maintain a maximum value of 10 ppm.
- 27 Ammonia: Maintain a maximum value of 20 ppm.
- 28 Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.

29
30 Submittals

31 **Product Data:** Include rated capacities, operating characteristics, furnished specialties, and accessories
32 for the following products:

- 33 Bypass feeders.
- 34 Chemical test equipment.
- 35 Chemical material safety data sheets.

36 **Operation and Maintenance Data:** For sensors and controllers to include in emergency, operation, and
37 maintenance manuals.

38 **Other Informational Submittals:**

- 39 **Water-Treatment Program:** Written sequence of operation on an annual basis for the
40 application equipment required to achieve water quality defined in the "Performance
41 Requirements" Article above.
- 42 **Water Analysis:** Illustrate water quality available at Project site.

43
44 Quality Assurance

45 **HVAC Water-Treatment Service Provider Qualifications:** An experienced HVAC water-treatment service
46 provider capable of analyzing water qualities, installing water-treatment equipment, and applying water
47 treatment as specified in this Section.

1 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100,
2 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

3 4 PRODUCTS

5 6 Manufacturers

7 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

8 Ampion Corp.

9 Anderson Chemical Co, Inc.

10 Aqua-Chem, Inc.; Cleaver-Brooks Div.

11 Barclay Chemical Co.; Water Management, Inc.

12 Boland Trane Services

13 GE Betz.

14 GE Osmonics.

15 H-O-H Chemicals, Inc.

16 Metro Group, Inc. (The); Metropolitan Refining Div.

17 ONDEO Nalco Company.

18 Watcon, Inc.

19 20 Manual Chemical-Feed Equipment

21 Bypass Feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the
22 top, and NPS 3/4 bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and
23 diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.

24 Capacity: 5 gal..

25 Minimum Working Pressure: 175 psig.

26 27 Chemical Treatment Test Equipment

28 Test Kit: Manufacturer-recommended equipment and chemicals in a wall-mounting cabinet for testing
29 pH, TDS, inhibitor, chloride, alkalinity, and hardness; sulfite and testable polymer tests for high-pressure
30 boilers, and oxidizing biocide test for open cooling systems.

31 Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping,
32 valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon
33 in the test-coupon assembly.

34 Two-station rack for closed-loop systems.

35 36 Chemicals

37 Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with
38 piping system components and connected equipment, and that can attain water quality specified in
39 Part 1 "Performance Requirements" Article.

40 41 EXECUTION

42 43 Water Analysis

44 Perform an analysis of supply water to determine quality of water available at Project site.

45 46 Installation

47 Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's
48 recommended clearances. Arrange units so controls and devices that require servicing are accessible.

48 Install water testing equipment on wall near water chemical application equipment.

- 1 Install interconnecting control wiring for chemical treatment controls and sensors.
 2 Bypass Feeders: Install in closed hydronic systems, including hot-water heating and chilled water, and
 3 equipped with the following:
 4 Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise
 5 indicated on Drawings.
 6 Install test-coupon assembly in bypass circuit around circulating pumps, unless
 7 otherwise indicated on Drawings.
 8 Install a full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
 9 Install a swing check on inlet after the isolation valve.

10

11 Connections

- 12 Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general
 13 arrangement of piping, fittings, and specialties.
 14 Install piping adjacent to equipment to allow service and maintenance.
 15 Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with
 16 dielectric fittings. Dielectric fittings are specified in Division 23 Section "Basic Mechanical Materials and
 17 Methods."
 18 Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves
 19 are specified in Division 23 Section "Valves."
 20 Confirm applicable electrical requirements in Division 26 Sections for connecting electrical equipment.
 21 Ground equipment according to Division 26 Section "Grounding and Bonding."
 22 Connect wiring according to Division 26 Section "Conductors and Cables."

23

24 Field Quality Control

- 25 **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect, test, and
 26 adjust components, assemblies, and equipment installations, including connections. Report results in
 27 writing.
 28 Perform tests and inspections and prepare test reports.
 29 **Manufacturer's Field Service:** Engage a factory-authorized service representative to
 30 inspect components, assemblies, and equipment installations, including connections,
 31 and to assist in testing.

32 **Tests and Inspections:**

- 33 Inspect field-assembled components and equipment installation, including piping and
 34 electrical connections.
 35 Inspect piping and equipment to determine that systems and equipment have been
 36 cleaned, flushed, and filled with water, and are fully operational before introducing
 37 chemicals for water-treatment system.
 38 Place HVAC water-treatment system into operation and calibrate controls during the
 39 preliminary phase of HVAC systems' startup procedures.
 40 Do not enclose, cover, or put piping into operation until it is tested and satisfactory test
 41 results are achieved.
 42 Test for leaks and defects. If testing is performed in segments, submit separate report
 43 for each test, complete with diagram of portion of piping tested.
 44 Leave uncovered and unconcealed new, altered, extended, and replaced water piping
 45 until it has been tested and approved. Expose work that has been covered or concealed
 46 before it has been tested and approved.
 47 Cap and subject piping to static water pressure of 50 psig above operating pressure,
 48 without exceeding pressure rating of piping system materials. Isolate test source and

1910

- 1 allow test pressure to stand for four hours. Leaks and loss in test pressure constitute
- 2 defects.
- 3 Repair leaks and defects with new materials and retest piping until no leaks exist.
- 4 Remove and replace malfunctioning units and retest as specified above.
- 5
- 6 END OF SECTION
- 7

1 SECTION 23 3113 - METAL DUCTS

2
3 GENERAL

4
5 Summary

6 This Section includes metal ducts for supply, return, outside, and exhaust air-distribution
7 systems in pressure classes from minus 2- to plus 10-inch wg. Metal ducts include the following:
8 Rectangular ducts and fittings.
9 Single-wall, round spiral-seam ducts and formed fittings.

10
11 System Description

12 Duct system design, as indicated, has been used to select size and type of air-moving and -
13 distribution equipment and other air system components. Changes to layout or configuration of
14 duct system must be specifically approved in writing by Architect. Accompany requests for
15 layout modifications with calculations showing that proposed layout will provide original design
16 results without increasing system total pressure.

17
18 Quality Assurance

19 NFPA Compliance:

20 NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

21 NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

22
23 ASHRAE Compliance: Applicable requirements in the current adopted version of ASHRAE 62.1,
24 Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
25 ASHRAE/IESNA Compliance: Applicable requirements in the current adopted version of
26 ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

27
28 PRODUCTS

29
30 Manufacturers

31 In other Part 2 articles where titles below introduce lists, the following requirements apply to
32 product selection:

33 Manufacturers: Subject to compliance with requirements, provide products by one of
34 the manufacturers specified.

35
36 Sheet Metal Materials

37 Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable
38 materials, material thicknesses, and duct construction methods, unless otherwise indicated.
39 Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations,
40 and other imperfections.

41 Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653 and having G60
42 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

43 Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on
44 galvanized sheet metal ducts.

45 Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch
46 minimum diameter for lengths longer than 36 inches.

1 Sealant Materials

2 Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or
3 mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

4 Joint and Seam Tape: 2 inches wide; glass-fiber-reinforced fabric.

5 Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and
6 modified acrylic/silicone activator to react exothermically with tape to form hard, durable,
7 airtight seal.

8 Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when
9 cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.

10 Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized
11 butyl sealant formulated with a minimum of 75 percent solids.

12 Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with
13 ASTM C 920, Type S, Grade NS, Class 25, Use O.

14 Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.
15

16 Hangers And Supports

17 Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel
18 fasteners appropriate for construction materials to which hangers are being attached.

19 Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for
20 slabs more than 4 inches thick.

21 Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate
22 concretes or for slabs less than 4 inches thick.

23 Hanger Materials: Galvanized sheet steel or threaded steel rod.

24 Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or
25 galvanized rods with threads painted with zinc-chromate primer after installation.

26 Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--
27 Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.

28 Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted
29 with zinc-chromate primer.

30 Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible
31 with duct materials.

32 Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
33

34 Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

35 Rectangular Duct Fabrication

36 Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction
37 according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying
38 with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and
39 joint types and intervals.

40 Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and
41 rigidity class required for pressure class.

42 Deflection: Duct systems shall not exceed deflection limits according to SMACNA's
43 "HVAC Duct Construction Standards--Metal and Flexible."

44 Transverse Joints: Prefabricated slide-on joints and components constructed using
45 manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint
46 reinforcement.
47
48

Manufacturers:

Ductmate Industries, Inc.

Nexus Inc.

Ward Industries, Inc.

Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

Manufacturers:

Ductmate Industries, Inc.

Lockformer.

Duct Size: Maximum 30 inches wide and up to 2-inch wg pressure class.

Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

Round Duct Fitting Fabrication

Round, Longitudinal or Spiral Lock Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

Duct Joints:

Ducts up to 20 Inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.

Ducts 21 to 72 Inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.

Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.

Manufacturers:

Ductmate Industries, Inc.

Lindab Inc.

90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.

Round Elbows 8 Inches and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

Round Elbows 9 through 14 Inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

1 Round Elbows Larger Than 14 Inches in Diameter and All Flat-Oval Elbows: Fabricate gored
 2 elbows unless space restrictions require mitered elbows.
 3 Die-Formed Elbows for Sizes through 8 Inches in Diameter and All Pressures 0.040 inch thick
 4 with 2-piece welded construction.
 5 Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
 6

7 EXECUTION

9 Duct Applications

10 Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

11 Supply Ducts (before Air Terminal Units): 3-inch wg.

12 Supply Ducts (after Air Terminal Units): 1-inch wg.

13 Supply Ducts (in Mechanical Equipment Rooms): 3-inch wg.

14 Return Ducts (Negative Pressure): 1-inch wg.

15 Exhaust Ducts (Negative Pressure): 2-inch wg.

16 Duct Installation

17 Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal
 18 and Flexible," unless otherwise indicated.

19 Install round ducts in lengths not less than 12 feet unless interrupted by fittings.

20 Install ducts with fewest possible joints.

21 Install fabricated fittings for changes in directions, size, and shape and for connections.

22 Install couplings tight to duct wall surface with a minimum of projections into duct. Secure
 23 couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3
 24 screws in each coupling.

25 Install ducts, unless otherwise indicated, vertically and horizontally and parallel and
 26 perpendicular to building lines; avoid diagonal runs.

27 Install ducts close to walls, overhead construction, columns, and other structural and permanent
 28 enclosure elements of building.

29 Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

30 Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions
 31 unless specifically indicated.

32 Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts,
 33 and similar finished work.

34 Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward
 35 to cover entire joint and sheet metal screws.

36 Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and
 37 electrical equipment spaces and enclosures.

38 Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and
 39 exterior walls and are exposed to view, conceal spaces between construction openings and
 40 ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap
 41 openings on 4 sides by at least 1-1/2 inches.

42 Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior
 43 walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke
 44 dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and
 45 installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."

46 Protect duct interiors from the elements and foreign materials until building is enclosed. Follow
 47 SMACNA's "Duct Cleanliness for New Construction."

- 1 Paint interiors of metal ducts that do not have duct liner, for 24 inches upstream of registers and
 2 grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer.
 3 Paint materials and application requirements are specified in Division 9 painting Sections.
- 4 **Underslab Ducts, Special Installation Requirements**
 5 Verify undamaged condition of ducts before enclosure with fill or encasement.
 6 Protect ducts from damage by equipment used in placing fill materials and concrete on or
 7 around ducts.
 8 Protect duct openings from damage and prevent entrance of foreign materials.
- 9 **Seam And Joint Sealing**
 10 Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal
 11 and Flexible" for duct pressure class indicated.
 12 For pressure classes lower than 2-inch wg, seal transverse joints.
 13 Seal ducts before external insulation is applied.
- 14 **Hanging And Supporting**
 15 Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch
 16 intersection.
 17 Support vertical ducts at maximum intervals of 16 feet and at each floor.
 18 Install upper attachments to structures with an allowable load not exceeding one-fourth of
 19 failure (proof-test) load.
 20 Install concrete inserts before placing concrete.
 21 Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 22 Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or
 23 for slabs less than 4 inches thick.
- 24 **Connections**
 25 Make connections to equipment with flexible connectors according to Division 15 Section
 26 "Duct Accessories."
 27 Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch,
 28 outlet and inlet, and terminal unit connections.
- 29 **Field Quality Control**
 30 Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct
 31 Leakage Test Manual" and prepare test reports:
 32 Disassemble, reassemble, and seal segments of systems to accommodate leakage testing
 33 and for compliance with test requirements.
 34 Conduct tests at static pressures equal to maximum design pressure of system or section
 35 being tested. If pressure classes are not indicated, test entire system at maximum
 36 system design pressure. Do not pressurize systems above maximum design operating
 37 pressure. Give seven days' advance notice for testing.
 38 Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round
 39 ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to
 40 2-inch wg(both positive and negative pressures), and Leakage Class 6 for pressure classes
 41 from 2- to 10-inch wg.
 42 Remake leaking joints and retest until leakage is equal to or less than maximum
 43 allowable.
 44
 45 Ducts with a Pressure Class Higher Than 2-inch wg: Test representative duct sections
 46 totaling no less than 25 percent of total installed duct area for each AHU system.
 47 Supply Ducts with a Pressure Class of 2-inch wg: or Higher: Test representative duct
 48 sections totaling no less than 25 percent of total installed duct area for each AHU system.

1
2 Disassemble, reassemble, and seal segments of systems to accommodate leakage testing
3 and for compliance with test requirements.

4 Test for leaks before applying external insulation.

5 Conduct tests at static pressures equal to maximum design pressure of system or section
6 being tested. If static-pressure classes are not indicated, test system at maximum system
7 design pressure. Do not pressurize systems above maximum design operating pressure.

8 Give seven days' advance notice for testing.

9 Cleaning New Systems

10 Mark position of dampers and air-directional mechanical devices before cleaning, and
11 perform cleaning before air balancing.

12 Use service openings, as required, for physical and mechanical entry and for inspection.

13 Create other openings to comply with duct standards.

14 Disconnect flexible ducts as needed for cleaning and inspection.

15 Remove and reinstall ceiling sections to gain access during the cleaning process.

16 Vent vacuuming system to the outside. Include filtration to contain debris removed from
17 HVAC systems, and locate exhaust down wind and away from air intakes and other points
18 of entry into building.

19 Clean the following metal duct systems by removing surface contaminants and deposits:

20 Air outlets and inlets (registers, grilles, and diffusers).

21 Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply
22 and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive
23 assemblies.

24 Air-handling unit internal surfaces and components including mixing box, coil section, air
25 wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers,
26 filters and filter sections, and condensate collectors and drains.

27 Coils and related components.

28 Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical
29 equipment rooms.

30 Supply-air ducts, dampers, actuators, and turning vanes.

31 Mechanical Cleaning Methodology:

32 Clean metal duct systems using mechanical cleaning methods that extract contaminants
33 from within duct systems and remove contaminants from building.

34 Use vacuum-collection devices that are operated continuously during cleaning. Connect
35 vacuum device to downstream end of duct sections so areas being cleaned are under
36 negative pressure.

37 Use mechanical agitation to dislodge debris adhered to interior duct surfaces without
38 damaging integrity of metal ducts, duct liner, or duct accessories.

39 Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner
40 to get wet.

41 Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational.

42 Rinse coils with clean water to remove latent residues and cleaning materials; comb and
43 straighten fins.

44 Cleanliness Verification:

45 Visually inspect metal ducts for contaminants.

46 Where contaminants are discovered, re-clean and reinspect ducts.

47
48 **END OF SECTION**

1 SECTION 23 3300 - DUCT ACCESSORIES

2
3 GENERAL

4
5 Summary

6 This Section includes the following:

- 7 Backdraft dampers.
- 8 Volume dampers.
- 9 Motorized control dampers.
- 10 Fire dampers.
- 11 Ceiling fire dampers.
- 12 Smoke dampers.
- 13 Combination fire and smoke dampers.
- 14 Duct silencers.
- 15 Turning vanes.
- 16 Duct-mounting access doors.
- 17 Flexible connectors.
- 18 Flexible ducts.
- 19 Duct accessory hardware.

20 Related Sections include the following:

- 21 Division 26 Section "Fire Alarm" for duct-mounting fire and smoke detectors.
- 22 Division 23 Section "HVAC Instrumentation and Controls" for electric and pneumatic damper
- 23 actuators.

24
25 Submittals

26 Product Data: For the following:

- 27 Backdraft dampers.
- 28 Volume dampers.
- 29 Motorized control dampers.
- 30 Fire dampers.
- 31 Ceiling fire dampers.
- 32 Smoke dampers.
- 33 Combination fire and smoke dampers.
- 34 Duct silencers.
- 35 Turning vanes.
- 36 Duct-mounting access doors.
- 37 Flexible connectors.
- 38 Flexible ducts.

39
40 Extra Materials

41 Furnish extra materials described below that match products installed and that are packaged
42 with protective covering for storage and identified with labels describing contents.

43 Fusible Links: Furnish quantity equal to 10 percent of amount installed.

44
45 PRODUCTS

46
47 Manufacturers

48 In other Part 2 articles where titles below introduce lists, the following requirements apply to
49 product selection:

50 Manufacturers: Subject to compliance with requirements, provide products by one of the
51 manufacturers specified.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50

Sheet Metal Materials

Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

Backdraft Dampers

Manufacturers:

Greenheck.
Penn Ventilation Company, Inc.
Ruskin Company.

Description: Multiple-blade, parallel action gravity balanced, with blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.
Frame: 0.052-inch thick, galvanized sheet steel, with welded corners and mounting flange.
Blades: 0.025-inch-thick, roll-formed aluminum.
Blade Seals: Neoprene.
Blade Axles: Galvanized steel.
Tie Bars and Brackets: Galvanized steel.
Return Spring: Adjustable tension.

Volume Dampers

Manufacturers:

Flexmaster U.S.A., Inc.
McGill AirFlow Corporation.
METALAIR, Inc.
Nailor Industries Inc.
Penn Ventilation Company, Inc.
Ruskin Company.

General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

Pressure Classes of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.

Roll-Formed Steel Blades: 0.064-inch-thick, galvanized sheet steel.

Blade Axles: Galvanized steel.

Bearings: Molded synthetic

Tie Bars and Brackets: Galvanized steel.

1 Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as
 2 indicated, low-leakage rating with linkage outside airstream, and suitable for horizontal or
 3 vertical applications.

4 Steel Frames: Angle-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with
 5 mitered and welded corners; frames with flanges where indicated for attaching to walls and
 6 flangeless frames where indicated for installing in ducts.

7 Roll-Formed Steel Blades: 0.064-inch-thick, galvanized sheet steel.

8 Blade Axles: Galvanized steel.

9 Bearings: Molded synthetic thrust or ball.

10 Blade Seals: Neoprene.

11 Jamb Seals: Cambered aluminum.

12 Tie Bars and Brackets: Galvanized steel.

13 Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly
 14 mounted on supports at each mullion and at each end of multiple-damper assemblies.

15 Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-
 16 damper assembly.

17 Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-
 18 plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-
 19 rod size. Include elevated platform for insulated duct mounting.

21 Motorized Control Dampers

22 Manufacturers:

23 Greenheck.

24 McGill AirFlow Corporation.

25 METALAIR, Inc.

26 Nailor Industries Inc.

27 Penn Ventilation Company, Inc.

28 Ruskin Company.

29 General Description: AMCA-rated, opposed-blade design; minimum of 0.1084-inch thick,
 30 galvanized-steel frames with holes for duct mounting; minimum of 0.0635-inch thick,
 31 galvanized-steel damper blades with maximum blade width of 8 inches.

32 Secure blades to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon
 33 blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-
 34 stainless-steel blade bearings, and thrust bearings at each end of every blade.

35 Operating Temperature Range: From minus 40 to plus 200 deg F.

36 Provide closed-cell neoprene edging.

37 Combination Fire And Smoke Dampers

38 Manufacturers:

39 Greenheck.

40 Nailor Industries Inc.

41 Ruskin Company.

42 General Description: Labeled according to UL 555S. Combination fire and smoke dampers shall
 43 be labeled according to UL 555 for 1-1/2-hour rating.

44 Fusible Links: Replaceable, 212 deg F rated, unless noted otherwise

45 Frame and Blades: 0.064-inch thick, galvanized sheet steel.

46 Mounting Sleeve: Factory-installed, 0.052-inch thick, galvanized sheet steel; length to suit wall
 47 or floor application.

48 Damper Motors: Modulating and two-position action.

49 Comply with requirements in Division 15 Section "Motors."

50 Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.

1 Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose
 2 entire spring mechanism in a removable housing designed for service or adjustments. Size for
 3 running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 4 Electrical Connection: 115 V, single phase, 60 Hz.
 5 End Switches: Provide factory installed end switches for monitoring, open/close.
 6

7 Duct Silencers

8 Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in
 9 ASHRAE 62.1-2004.

10 Manufacturers:

11 Ruskin Company.

12 Vibro-Acoustics.

13 General Description: Factory-fabricated and -tested, round or rectangular silencers with
 14 performance characteristics and physical requirements as indicated.

15 Fire Performance: Adhesives, sealants, packing materials, and accessory materials shall have
 16 fire ratings not exceeding 25 for flame-spread index and 50 for smoke-developed index when
 17 tested according to ASTM E 84.

18 Rectangular Units: Fabricate casings with a minimum of 0.034-inch thick, solid galvanized sheet
 19 metal for outer casing and 0.022-inch thick, ASTM A 653, G60, perforated galvanized sheet
 20 metal for inner casing.

21 Round Units:

22 Outer Casings:

23 ASTM A 653, G60, galvanized sheet steel.

24 Up to 24 Inches in Diameter: 0.034 inch thick.

25 26 through 40 Inches in Diameter: 0.040 inch thick.

26 42 through 52 Inches in Diameter: 0.052 inch thick.

27 54 through 60 Inches in Diameter: 0.064 inch thick.

28 Casings fabricated of spiral lock-seam duct may be one size thinner than that indicated.

29 Interior Casing, Partitions, and Baffles:

30 ASTM A 653, G60, galvanized sheet steel.

31 At least 0.034 inch thick and designed for minimum aerodynamic losses.

32 Sheet Metal Perforations: 1/8-inch diameter for inner casing and baffle sheet metal.

33 Fill Material: Moisture-proof nonfibrous material.

34 Erosion Barrier: Polymer bag enclosing fill and heat-sealed before assembly.

35 Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to
 36 system pressure variations.

37 Do not use nuts, bolts, or sheet metal screws for unit assemblies.

38 Lock form and seal or continuously weld joints.

39 Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and
 40 spaced to prevent deflection or distortion.

41 Reinforcement: Cross or trapeze angles for rigid suspension.

42 Source Quality Control:

43 Acoustic Performance: Test according to ASTM E 477.

44 Record acoustic ratings, including dynamic insertion loss and self-noise power levels with an
 45 airflow of at least 2000-fpm face velocity.

46 Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 6-inch wg
 47 static pressure, whichever is greater.
 48

49 Turning Vanes

50 Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for
 51 vanes and vane runners. Vane runners shall automatically align vanes.

1 Manufactured Turning Vanes: Fabricate 1-1/2-inch wide, double-vane, curved blades of
 2 galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches
 3 o.c.; and set into vane runners suitable for duct mounting.

4 Manufacturers:

5 Ductmate Industries, Inc.

6 METALAIR, Inc.

7 Ward Industries, Inc.

8 Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and
 9 fibrous-glass fill.

10 Duct-Mounting Access Doors

11 General Description: Fabricate doors airtight and suitable for duct pressure class.

12 Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with
 13 insulation fill and thickness as indicated for duct pressure class. Include vision panel where
 14 indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

15 Manufacturers:

16 Ductmate Industries, Inc.

17 Flexmaster U.S.A., Inc.

18 Greenheck.

19 Nailor Industries Inc.

20 Ward Industries, Inc.

21 Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

22 Provide number of hinges and locks as follows:

23 Less Than 12 Inches Square: Secure with two sash locks.

24 Up to 18 Inches Square: Two hinges and two sash locks.

25 Up to 24 by 48 Inches: Three hinges and two compression latches with outside and
 26 inside handles.

27 Sizes 24 by 48 Inches and Larger: One additional hinge.

28 Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with
 29 insulation fill and 1-inch thickness. Include cam latches.

30 Manufacturers:

31 Ductmate Industries, Inc.

32 Flexmaster U.S.A., Inc.

33 Frame: Galvanized sheet steel, with spln-in notched frame.

34 Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

35 Insulation: 1-inchthick, fibrous-glass or polystyrene-foam board.

36 Flexible Connectors

37 Manufacturers:

38 Ductmate Industries, Inc.

39 Ventfabrics, Inc.

40 Ward Industries, Inc.

41 General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives
 42 complying with UL 181, Class 1.

43 Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to
 44 two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick
 45 aluminum sheets. Select metal compatible with ducts.

46 Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

47 Minimum Weight: 26 oz./sq. yd.

48 Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

49 Service Temperature: Minus 40 to plus 200 deg F.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49

Flexible Ducts

Manufacturers:

Flexmaster U.S.A., Inc.

Hart & Cooley, Inc.

Insulated-Duct Connectors: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film.

Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

Maximum Air Velocity: 4000 fpm.

Temperature Range: Minus 10 to plus 160 deg F.

Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.

Maximum Air Velocity: 4000 fpm .

Temperature Range: Minus 20 to plus 175 deg F .

Insulation R-Value: Comply with ASHRAE/IESNA 90.1-2004.

Flexible Duct Connectors:

Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches , to suit duct size.

Non-Clamp Connectors: Liquid adhesive plus tape.

Duct Accessory Hardware

Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

EXECUTION

Application And Installation

Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.

Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel.

Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated

Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

Provide test holes at fan inlets and outlets and elsewhere as indicated.

Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.

Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:

Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.

- 1 On sides of ducts where adequate clearance is available.
- 2 Install the following sizes for duct-mounting, rectangular access doors:
- 3 One-Hand or Inspection Access: 8 by 5 inches.
- 4 Two-Hand Access: 12 by 6 inches.
- 5 Head and Hand Access: 18 by 10 inches.
- 6 Head and Shoulders Access: 21 by 14 inches.
- 7 Body Access: 25 by 14 inches.
- 8 Body Plus Ladder Access: 25 by 17 inches.
- 9 Install the following sizes for duct-mounting, round access doors:
- 10 One-Hand or Inspection Access: 8 inches in diameter.
- 11 Two-Hand Access: 10 inches in diameter.
- 12 Head and Hand Access: 12 Inches in diameter.
- 13 Head and Shoulders Access: 18 Inches in diameter.
- 14 Body Access: 24 inches in diameter.
- 15 Label access doors according to Division 23 Section "Mechanical Identification."
- 16 Install flexible connectors immediately adjacent to equipment in ducts associated with fans and
- 17 motorized equipment supported by vibration isolators.
- 18 For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with
- 19 loaded vinyl sheet held in place with metal straps.
- 20 Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not
- 21 use flexible ducts to change directions.
- 22 Connect diffusers low pressure ducts with maximum 60-inch lengths of flexible duct clamped or
- 23 strapped in place.
- 24 Connect flexible ducts to metal ducts with draw bands.
- 25 Install duct test holes where indicated and required for testing and balancing purposes.
- 26
- 27 Adjusting
- 28 Adjust duct accessories for proper settings.
- 29 Adjust fire and smoke dampers for proper action.
- 30 Final positioning of manual-volume dampers is specified in Division 15 Section "Testing,
- 31 Adjusting, and Balancing."
- 32
- 33 END OF SECTION

1 SECTION 26 0010 - ELECTRICAL GENERAL PROVISIONS

2
3 GENERAL

4
5 Related Documents The General Conditions, Special Conditions, And Contract Documents are part of
6 these Specifications. Consult them further for instructions and be governed by the requirements
7 contained thereunder.

8
9 Description

10 Work Included: Work shall consist of furnishing all labor, equipment, supplies and materials,
11 unless otherwise specified, necessary for the installation of complete electrical systems as
12 required by the specifications and as shown on the drawings, subject to the terms and
13 conditions of the contract. The work shall also include the completion of those details of
14 electrical work not mentioned or shown which are necessary for the successful operation of all
15 electrical systems.

16 Work Not Included: Certain labor, materials, and equipment may be furnished under other
17 sections of these specifications, by Utility Companies or by the Owner; when this is the case,
18 the extent, source, and description of these items will be as indicated on the drawings or as
19 described in the specification.

20
21 Provisions: Work Performed Under This Division Of The Specifications Shall Conform To The
22 Requirements Of Division 1, The Electrical Drawings, And All Items Hereinafter Specified.

23
24 Prior to any work being performed under this division, examine architectural, structural, food
25 service, civil, mechanical, specialty systems, and interior design drawings and specifications. If
26 any discrepancies occur between them and the electrical drawings and specifications, report
27 discrepancies to the Architect in writing and obtain written instructions for the work.

28
29 Electrical drawings are diagrammatic, but shall be followed as closely as actual construction of
30 the building will permit. All changes from drawings necessary to make the electrical work
31 conform to the building as constructed shall be made without additional cost to the Owner.

32
33 Coordinate the electrical work with the General Contractor and be responsible to him for
34 satisfactory progress of the same. Coordinate electrical work with all other trades on the
35 project without additional cost to the Owner.

36
37 All work and materials covered by drawings and specifications shall be subject to review at any
38 time by representatives of the Architect and Owner. If the Architect or Owner's agent finds
39 any materials or installation that does not conform to these drawings and specifications,
40 Contractor shall remove the material from the premises and correct the installation to the
41 satisfaction of the agent.

42
43 In acceptance or rejection of installed electrical systems, no allowance will be made for lack of
44 skill on the part of the installers.

45
46 Codes And Standards: The Latest Editions Of The Following Standards (Including Supplements And
47 Official Interpretations) Are Minimum Requirements:

48 NFPA 70 - National Electrical Code (NEC).

- 1 NFPA 72 – National Fire Alarm Code.
 2 NFPA 101 – Life Safety Code.
 3 Conform to all applicable State and Local Codes.
 4 American National Standards Institute (ANSI).
 5 National Electrical Safety Code (NESC).
 6 Americans with Disabilities Acts (ADA) and American National Standards Institute (ANSI) 117.
 7 National Electrical Manufacturer’s Association (NEMA).
 8 Underwriter’s Laboratories (UL).
 9 Insulated Cable Engineers Association (ICEA).
 10 Uniform Building Code.
 11 Uniform Mechanical Code.
 12 Uniform Fire Code.
 13 Institute of Electrical and Electronic Engineers (IEEE).
 14 Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
 15 The complete installation shall comply with requirements of the utility and telephone
 16 companies furnishing service to this installation. The drawings and specifications take
 17 precedence when they are more stringent than codes, statutes, or ordinances in effect.
 18 Applicable codes, ordinances, standards and statutes take precedence when they are more
 19 stringent or conflict with the drawings and specifications.

20

21 Special Requirements

22

23 Definitions: “Provide” shall mean “furnish and install”. “Furnish” means to supply all materials, labor,
 24 equipment, testing apparatus, controls, tests, accessories and all other items customarily required for
 25 the proper and complete application. “Install” means to join, unit, fasten, link, attach, set up or
 26 otherwise connect together before testing and turning over to Owner, complete and ready for regular
 27 operation. The words “accept” or “acceptable” denote only that the equipment items are in general
 28 conformance with the design concept of the project.

29

30 Drawings:

31

32 The drawings indicate the general arrangement of circuits and outlets, locations of switches,
 33 panelboards and other work. Information shown on the drawings is schematic, however,
 34 re-circuiting will not be permitted without specific acceptance. Drawings and specifications are
 35 complementary to each other. What is called for by one shall be as binding as if called for by
 36 both. Data presented on these drawings is accurate as planning can be determined, but
 37 accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit
 38 field conditions is directed. Review all Architectural, Structural and Mechanical Drawings and
 39 Specifications; adjust all work to conform to all conditions shown therein. The Architectural
 40 drawings shall take precedence over all other drawings.

40

41

42

43

44

45

46

47

48

46 Examination Of Bidding Documents

Each bidder shall examine the bidding documents carefully, and not later than seven days
 prior to the date of receipt of bids, shall make written request to the Engineer for

1 interpretation or correction of any discrepancies, ambiguity, inconsistency, or error therein
2 which he may discover. Any interpretation or correction will be issued as an addendum by
3 the Architect. Only a written interpretation or correction by addendum shall be binding.
4 No bidder shall rely upon interpretations or corrections given by any other method. If
5 discrepancies, ambiguity, inconsistency, or error are not covered by addendum or written
6 directive, Contractor shall include in his bid, labor materials and methods of construction
7 resulting in higher cost. After award of contract, no allowance or extra compensation will be
8 made on behalf of the Contractor due to his failure to make the written requests as described
9 above.

10 Failure to request clarification during the bid period of any inadequacy, omission, or conflict
11 will not relieve the Contractor of their responsibilities. The signing of the contract will be
12 considered as implicitly denoting that the Contractor has a thorough comprehension of the
13 full intent and scope of the working drawings and specifications.

14 Permits, Fees & Notices

15 Obtain and pay for all necessary permits, inspections and certificates that may be necessary
16 for the full completion of the work. Furnish the Owner with a certificate of final inspection
17 and approval from the AHJ over the electrical installation.

18 Notify proper authorities when work is ready for inspections required by applicable codes,
19 rules and regulations, allowing sufficient time for inspections to be made without hindering
20 progress of the work. Furnish to the Owner copies of inspection certificates of acceptance.

21
22
23 Tests: Upon Completion Of All Work And Adjustment Of All Equipment, Provide Complete Operational
24 Tests Of All Electrical Equipment Provided Under This Division.

25
26 Warranty: Guarantee That All Work Governed By This Division Shall Be Free Of Defects In Workmanship,
27 Materials And Parts For A Period Of One (1) Year After Written Acceptance. Promptly Repair, Revise,
28 And Replace Defects As Directed With No Additional Cost To The Owner (Lamps And Fuses Are Exempt).

29 Record Drawings

30 Maintain a current set of electrical drawings at the site. Neatly mark all changes and
31 deviations from the original drawings. Use a color which contrasts with the prints. This
32 shall be a separate set of drawings, not used for construction purposes, and shall be kept up
33 to date as the job progresses and shall be made available for inspection by the Architect at all
34 times. These updated progress drawings shall be used to produce the final record drawings
35 that shall be in AutoCad electronic format media upon project completion.

36 Upon completion of the contract, both sets (electronic and hard copy drawings) of record
37 drawings shall be delivered to the Architect.

38 The Contractor shall mark all record drawings on the front lower right hand corner with a
39 stamp impression that reads 'RECORD DRAWINGS' or similar.

40 Project/Site Conditions

41 Install work in locations shown on Drawings, unless prevented by Project conditions.

42 Prior to submitting a bid, visit the site of job and ascertain all conditions affecting the
43 proposed installation and adjust all work accordingly. Make provisions for these costs.

44 Coordinate the work with that of all other trades. Where conflicts of work occur and
45 departure from the indicated arrangements are necessary, consult with other Contractors
46
47

1 involved; come to agreement as to changed locations and elevations, etc., and obtain written
2 acceptance from the Architect of proposed changes before proceeding with work.

3 All outages of electrical service shall be scheduled with the Owner and Utility Company five
4 (5) days in advance of proposed outage. Include an overtime allowance in the bid for the
5 performance of all work requiring outages at such time as it is approved by the Owner.

6 Outages shall be at a time and of such duration as accepted by the Owner.
7

8 Sequencing and Scheduling: Construct Work in sequence under provisions of Division 1.
9

10 Use Of The Architect's And/Or Engineer's Drawings: The Contractor shall obtain, at the Contractor's
11 expense, from the Architect or Engineer a set of AutoCAD or compatible format architectural and
12 engineering drawings on electronic media where desired by the Contractor and/or required by the
13 Specifications for use in preparing the shop drawings, coordination drawings, and record drawings.
14 The Contractor shall provide to the Architect and Engineer a written release of liability acceptable to the
15 Architect and Engineer prior to receiving the electronic media.
16

17 PRODUCTS

18
19 Standard For Materials: All materials shall conform to current applicable industry standards.
20 Workmanship and neat appearance shall be as important as the electrical and mechanical operation.
21 Defective or damaged materials shall be replaced or repaired, prior to final acceptance, in a manner
22 acceptable to the Architect or Owner at no additional cost to the Owner.
23 All electrical materials shall be acceptable for installation only if labeled or listed by a nationally
24 recognized testing laboratory and if accepted by local authorities.
25

26 Submittals

27 Submit under provision of Division 1.

28 Listing of Equipment: The Contractor shall submit, within thirty days after the award of the
29 contract, a complete typewritten list of those items of equipment which will be furnished
30 under this contract. Include the name or description of the item, name of manufacturer,
31 model, type, and catalog number.

32 Present shop drawing submittal data at one time, bound in three-ring binders, indexed in a
33 neat and orderly manner. Partial submittals will not be accepted. Do not begin work until
34 (1) copy is returned.

35 Submit five (5) copies of shop drawings, layouts, manufacturer's data, wiring diagrams and
36 material schedules that may be requested by the Architect for his review. The review by the
37 Architect will not constitute concurrence with any deviation from the plans and specifications
38 unless such deviations are specifically identified by the method described below, nor shall it
39 relieve the Contractor of responsibility for errors or omissions in the submitted data.

40 Processed shop drawings shall not be construed as change orders. The shop drawings shall
41 demonstrate that the Contractor understands the design concept, indicate which equipment
42 and materials he intends to provide, and detail the fabrication and installation methods he
43 intends to use. If deviations, discrepancies or conflicts between shop drawing submittals and
44 the design drawings and specifications are discovered, the design drawings and specifications
45 shall govern.

46 Contractor shall be responsible for dimensions (which he shall confirm and correlate at the job
47 site), fabrication processes and techniques of construction and coordination of his work with
48 that of other trades. The Contractor shall check and verify all measurements and review

1 shop drawings before submitting them and sign a statement on the shop drawings which
2 signifies that they comply with plans and specifications and that equipment is dimensionally
3 suitable for the application. If any deviations from the specified requirements for any item
4 of material or equipment exist, such deviation shall be expressly stated in writing and
5 incorporated with the submittal. The Owner's copies (two of each) of the reviewed
6 submittals shall be retained by the Contractor until completion of the project and presented in
7 bound form to the Owner.

8 Provide, with shop drawing submittal, 1/4" scale layout drawings of room with switchboards,
9 transformers, telephone backboards, panelboards, and data equipment. Layouts shall show
10 locations of, and shall be coordinated with mechanical equipment. Equipment shall be
11 drawn to scale.

12 Bid Alternate(S)

14 Refer to Division 1 and all contract documents for additional information.

15 Alternate(s) for Material and Equipment

16 Equipment and material bid alternate(s) shall be proposed as additive or deductive
17 alternate(s) to specified items by submitting it as a separate line item from the base bid
18 on the Bidder's letterhead.

19 Such bid alternate proposals shall not be substituted or included in the base bid. Bid
20 alternate proposal(s) must be accompanied by full descriptive data on the proposed
21 equipment, together with a statement of the cost to be added or deducted for each item.

22 The bid alternate shall include all materials, equipment, labor, electrical connections,
23 coordination with all other trades, etc. for a complete and operational system.

24 The Contractor shall submit the bid alternates at the time the base bids are due.

25 Substitution And Approvals (Prior Approvals)

26 Prior to Bidding: Where items of equipment or materials are specified by a manufacturer's
27 name, type, model, or catalog number, only those items may be used in the base bid unless
28 prior written acceptance of other material has been published by addendum.

29 Submit applications for this review in triplicate at least ten (10) calendar days prior to bid
30 opening.

31 Applications for review shall be accompanied by a typewritten list of the specified manufacturer
32 and catalog number and shall state all significant details in which each item differs from the
33 item specified. Failure to list this information shall not relieve the Contractor from providing
34 properly functioning or fitting materials regardless of the review action taken by the Architect.
35 The Contractor will provide only materials which have been specified or accepted prior to bid
36 opening, under his base bid.

37 Equipment and materials not listed as equivalents may be proposed as deductive
38 alternates to specified items by submitting it as a separate line item from the base bid
39 on the Bidder's letterhead.

40 Such substitution proposals shall not be substituted or included in the base bid.

41 Substitution proposal must be accompanied by full descriptive data on the proposed
42 equipment, together with a statement of the cost to be deducted for each item. If any
43 such substitutions are considered, the Contractor shall submit a list of the proposed
44 substitution items within 14 days of award of contract. The request for proposed
45 substitutions shall not be accepted by the Engineer due to scheduling or delivery
46 concerns.

Substitutions of Material after Award of Contract

Other items of material and equipment may be offered (at the Contractor's option) as alternates to specified items, either as provided for in the Proposal Forms or, if no provisions are made, by submitting it with his bid on the Bidder's letterhead.

Such alternate proposal shall not be included under the base bid and must be accompanied by full descriptive data on the proposed equipment, together with a statement of the cost to be added or deducted for each item. If any such alternate material proposals are considered, the Contractor shall submit a list of the proposed alternate substitution items in accordance with the requirements of "Review of Proposed Substitutions".

Substitutions (Contractor And/Or Owner Initiated)

Materials or equipment listed by several manufacturers' names are intended to be bidder's choice, and any of the listed manufacturers may be used in the base bid. Materials or equipment not listed are considered substitutions.

Performance Specification: When any item is specified by requirement to meet a performance, industry or regulating body standard or is specified generically (no manufacturer's name listed), no prior review by the Consulting Electrical Engineer is needed unless specifically called for in these specifications.

Contractor to be responsible for any changes and costs to accommodate any equipment except the first named in the specification.

Substitutions for Material

Equipment and materials not listed as equivalents may be proposed as deductive alternates to specified items by submitting it as a separate line item to the base bid on the Bidder's letterhead.

Such substitutions shall not be substituted for the base bid and must be accompanied by a full description of the difference between the Contract Document requirements and that of the substitution, the comparative features of each, and the effect of the change on the end result performance. Include the impact of all changes on other contractors and acknowledge the inclusion of additional costs to the other trades. If any such alternates are considered, the Contractor shall submit a list of the proposed alternate substitution items within 14 days of award of contract. Late requests for proposed substitutions will not be accepted by the Engineer due to scheduling or delivery concerns.

EXECUTIONWorkmanship and Completion Of Installation

Contractor's personnel and subcontractors selected to perform the work shall be well versed and skilled in the trades involved.

Coordinate electrical equipment and materials installation with other building components.

Sequence, coordinate, and integrate installations of electrical materials and equipment for

1 efficient flow of the Work. Give particular attention to large equipment requiring
2 positioning prior to closing-in the building.

3
4 Any changes or deviations from the drawings and specifications must be accepted in writing by
5 the Architect/Engineer. All errors in installation shall be corrected at the expense of the
6 Contractor. All specialties shall be installed as detailed on the drawings. Where detail or
7 specific installation requirements are not provided, manufacturer's recommendations shall be
8 followed.

9
10 Upon completion of work, all equipment and materials shall be installed complete, thoroughly
11 checked, correctly adjusted, and left ready for intended use or operation. All work shall be
12 thoroughly cleaned and all residue shall be removed from surfaces. Exterior surfaces of all
13 material and equipment shall be delivered in a perfect, unblemished condition.

14
15 Contractor shall provide a complete installation, including all required labor, material, cartage,
16 insurance, permits, and taxes.

17 18 Progress Of Work

19 Order the progress of electrical work to conform to the progress of the work of the other
20 trades. Complete the entire installation as soon as the condition of the building will permit.
21 Any cost resulting from defective or ill-timed work performed under this Section shall be
22 borne by this Contractor.

23 24 Trenching And Backfilling

25 Perform all trenching and backfilling required by work performed under this Section in
26 accordance with the excavating and grading specifications as herein specified. This work
27 shall comply with the requirements of Table 300-5 of the National Electrical Code.
28 Excavate trenches to the depth required for the utilities involved. The trench bottom shall be
29 graded true and free from stones or soft spots. Trenches through specially treated or surfaced
30 areas, such as paving or blacktop, shall have the width of the surface cutting extended for a
31 width of eight inches (8") on each side of the open trench. Unless otherwise noted, the
32 disturbed surfaces shall be replaced equal to the original construction, to the original grade
33 with the same type of material, and to the same depths and limits as the materials removed.
34 After acceptance by the Architect, backfill, tamp, and compact to insure against the possibility
35 of differential settling, in conformity with Division 2 Specifications. Verify location of existing
36 or new utilities and, if damaged by this Contractor, replace or repair.

37 38 Chases, Openings, Cutting, And Patching

39 Carefully lay out all work in advance so as to eliminate where possible, cutting, channeling,
40 chasing or drilling of floors, walls, partitions, ceilings and roofs. Any damage to the building,
41 structure, piping, ducts, equipment or any defaced finish shall be repaired by skilled
42 mechanics of the trades involved at no additional cost to the Owner and to the satisfaction of
43 the Architect. Any necessary cutting, channeling, drilling or anchoring of raceways, outlets, or
44 other electrical equipment shall be performed in a careful manner, and as accepted by the
45 Architect.

46 All openings made in fire-rated walls, floors, or ceilings shall be patched and made tight in a
47 manner to conform to the fire rating for the surface penetrated.

1 All penetrations required through existing concrete construction shall be core drilled at
 2 minimum size required. Precautions shall be taken when drilling to prevent damage to
 3 structural concrete. Contractor shall obtain permission from the Architect before proceeding
 4 with drilling.

5 Provide all cutting, trenching, backfilling, patching and refinishing or resurfacing required for
 6 electrical work in a manner meeting the approval of the Engineer and at no additional cost to
 7 the Owner.

8

9 Delivery And Storage Of Materials

10 Arrange and be held responsible for delivery and safe storage of materials and equipment for
 11 electrical installation.

12 Store materials and equipment for easy inspection and checking.

13 Carefully mark and store all materials.

14 Deliver materials to the job site in stages of the work that will expedite the work as a whole.

15 Carefully check materials furnished to this Contractor for installation, and provide receipt
 16 acknowledging acceptance of delivery and condition of the materials received. Thereafter,
 17 assume full responsibility for its safekeeping until the final installation has been reviewed and
 18 accepted.

19

20 Protection Of Work And Property

21 Where there are existing facilities, be responsible for the protection thereof, whether or not
 22 such facility is to be removed or relocated. Moving or removing any facility must be done so as
 23 not to cause interruption of the work of Owner's operation.

24 Close all conduit openings with caps or plugs during installation. Cover all fixtures and
 25 equipment and protect against injury. At the final completion, clean all work and deliver in an
 26 unblemished condition, or refinish and repaint at the discretion of the Architect.

27 Any equipment or conduit systems found to have been damaged or contaminated above
 28 "MILL" or "SHOP" conditions shall be replaced or cleaned to the Engineer's satisfaction.

29

30 Final Acceptance

31 Final acceptance by the Owner will not occur until all operating instructions are received and
 32 Owner's personnel have been thoroughly indoctrinated in the maintenance and operation of
 33 all equipment.

34 Operating manual, parts lists, and indoctrination of operating and maintenance personnel:

35 Furnish the services of a qualified representative of the supplier for each item or system
 36 itemized below who shall instruct specific personnel, as designated by the Owner, in the
 37 operation and maintenance of that item or system.

38 Instruction shall be made when the particular system is complete and shall be of the number
 39 of hours indicated and at the time requested by the Owner. A representative of the Electrical
 40 Contractor shall be present for all demonstrations.

41 Electrical distribution equipment under 600V, including MCC 2

42 Primary distribution equipment 4

43 Fire alarm system 2

44 Data system 4

45 Deliver three (3) complete operating manuals and parts lists to the Owner (or his designated
 46 representative) at the time of the above required indoctrination. Fully explain the contents of
 47 the manuals as part of required indoctrination and instruct the Owner's personnel in the
 48 correct procedure in obtaining service, both during and after the guarantee period. The

1 operating manual and parts lists shall give complete information as to whom the Owner shall
2 contact for service and parts, including the address and phone number. Furnish evidence that
3 an authorized service organization regularly carries a complete stock of repair parts for these
4 items (or systems), and that the organization is available for service. Service shall be furnished
5 within twenty four (24) hours after requested.

6 Clean up: Remove all materials, scrap, etc., relative to the electrical installation and leave the
7 premises and all equipment, lamps, fixtures, etc. in a clean, orderly condition. Any costs to the
8 Owner for clean-up of the site will be charged against the Contractor.

9 Acceptance Demonstration: Upon completion of the work, at a time to be designated by the
10 Architect, the Contractor shall demonstrate for the Owner the operation of the entire
11 installation, including all systems provided under this contract.

12 Operating and Acceptance Tests: Provide all labor, instruments, and equipment for the
13 performance of tests as specified. Submit three (3) copies of a typewritten test report for the
14 Architect for his approval.

15 Record the full load current in each phase or line at the main service entrance and for
16 each feeder leaving the main distribution panelboard. Readings shall be taken with the
17 maximum installed load connected and in operation.

18 Perform a careful inspection of the main switchboard bus structure and cable
19 connections to verify that all connections are mechanically and electrically tight.

20 Measure the resistance to ground for the service ground, which shall not exceed ten
21 (10) ohms under normal soil moisture conditions. If required, install additional ground
22 provisions in a manner accepted by the Engineer at no additional cost to the Owner.

23 24 Electrical Provisions For Roofs

25 Raceways penetrating roofs shall be installed in a manner to preserve the integrity of the roof.
26 Provide flashing and counter flashing for all roof penetrations required for the work.

27 Conduits routed above roofs shall be installed a minimum of twelve inches (12") above the
28 finished roof surface, supported on metal stands installed with flashing and counter flashing,
29 with maximum spacing of ten feet (10'-0").

30 Provide weatherproof duplex receptacles on roof so that no equipment installed on the roof is
31 more than twenty-five feet (25'-0") from a receptacle. Connect to nearest receptacle circuit
32 unless indicated on plans.

33 34 Mechanical Equipment Wiring And Connections

35 Unless otherwise indicated, all motors and controls shall be furnished, set in place, and wired
36 in accordance with the Mechanical Equipment Wiring and Connections Schedule. All items
37 necessary for a complete system shall be included in the base contract.

38 Provide electrical connections to mechanical equipment. Refer to the Mechanical
39 specifications and plans covering sprinkler systems, motor interlocks, switching, etc. Provide
40 wiring, conduit, outlets and final electrical connections to all equipment.

41 Where motor controllers are furnished by others, install controller and provide connections at
42 line and load side of controllers.

43 Where reduced voltage, multiple speed, duplex, triplex, lead-lag, pony motor and other
44 unusual controller types are utilized, coordinate specific requirements of motor(s) and
45 controller and provide required wiring between motor(s) and controller.

46 For electric water coolers verify whether the equipment is hard wired, cord and plug
47 connected and whether a remote chiller is provided. Provide circuiting and connections to
48 match.

1910

1 END OF SECTION

1 SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

2 GENERAL

3 RELATED DOCUMENTS

4 Drawings and general provisions of the Contract, including General and Supplementary Conditions
5 and Division 01 Specification Sections, apply to this Section.

6 SUMMARY

7 Section Includes:

8 Copper building wire rated 600 V or less.

9 Aluminum building wire rated 600 V or less.

10 Connectors, splices, and terminations rated 600 V and less.

11 DEFINITIONS

12 PV: Photovoltaic.

13 RoHS: Restriction of Hazardous Substances.

14 VFC: Variable-frequency controller.

15 ACTION SUBMITTALS

16 Product Data: For each type of product.

17 Product Schedule: Indicate type, use, location, and termination locations.

18 QUALITY ASSURANCE

19 Testing Agency Qualifications: Member company of NETA.

20 Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

21 PRODUCTS

22 COPPER BUILDING WIRE

23 Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an
24 overall insulation layer or jacket, or both, rated 600 V or less.

25 Products: Subject to compliance with requirements, available products that may be
26 incorporated into the Work include, but are not limited to, the following:

27 Alpha Wire Company.

28 American Bare Conductor.

29 Belden Inc.

30 Cerro Wire LLC.

31 Encore Wire Corporation.

32 General Cable Technologies Corporation.

33 Okonite Company (The).

34 Service Wire Co.

35 Southwire Company.

36 WESCO.

37 Standards:

1 Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for
2 intended location and use.

3 RoHS compliant.

4 Conductor and Cable Marking: Comply with wire and cable marking according to UL's
5 "Wire and Cable Marking and Application Guide."

6 Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8
7 ASTM B 496 for stranded conductors.

8 Conductor Insulation:

9 Type NM: Comply with UL 83 and UL 719.

10 Type RHH Type RHW-2: Comply with UL 44.

11 Type USE-2 Type SE: Comply with UL 854.

12 Type TC-ER: Comply with NEMA WC 70/ICEA S-95-658 and UL 1277.

13 Type THHN Type THWN-2: Comply with UL 83.

14 Type THW Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

15 Type UF: Comply with UL 83 and UL 493.

16 Type XHHW-2: Comply with UL 44.

17 Shield:

18 Type TC-ER: Cable designed for use with VFCs, with oversized crosslinked polyethylene
19 insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated
20 full-size ground wire dual spirally wrapped copper tape shields and three bare
21 symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.

22 ALUMINUM BUILDING WIRE

23 Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with
24 an overall insulation layer or jacket, or both, rated 600 V or less.

25 Aluminum conductors shall be considered only for wiring sizes 250 kcmil or over and only as a cost
26 savings measure where approved by owner.

27 Products: Subject to compliance with requirements, available products that may be incorporated
28 into the Work include, but are not limited to, the following:

29 Alpha Wire Company.

30 American Bare Conductor.

31 Belden Inc.

32 Cerro Wire LLC.

33 Encore Wire Corporation.

34 General Cable Technologies Corporation.

35 Okonite Company (The).

36 Southwire Company.

37 WESCO.

38 Standards:

1 Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for
2 intended location and use.

3 RoHS compliant.

4 Conductor and Cable Marking: Comply with wire and cable marking according to UL's
5 "Wire and Cable Marking and Application Guide."

6 Conductors: Aluminum, complying with ASTM B 800 and ASTM B 801.

7 Conductor Insulation:

8 Type NM: Comply with UL 83 and UL 719.

9 Type RHH Type RHW-2: Comply with UL 44.

10 Type USE-2 Type SE: Comply with UL 854.

11 Type THHN Type THWN-2: Comply with UL 83.

12 Type THW Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

13 Type XHHW-2: Comply with UL 44.

14 CONNECTORS AND SPLICES

15 Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material,
16 type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a
17 qualified testing agency, and marked for intended location and use.

18 Manufacturers: Subject to compliance with requirements, available manufacturers offering
19 products that may be incorporated into the Work include, but are not limited to, the following:

20 3M Electrical Products.

21 AFC Cable Systems; a part of Atkore International.

22 Gardner Bender.

23 Hubbell Power Systems, Inc.

24 Ideal Industries, Inc.

25 ILSCO.

26 NSi Industries LLC.

27 O-Z/Gedney; a brand of Emerson Industrial Automation.

28 Service Wire Co.

29 TE Connectivity Ltd.

30 Thomas & Betts Corporation; A Member of the ABB Group.

31 Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

32 Material: Copper.

33 Type: One hole with standard barrels.

34 Termination: Compression.

35 EXECUTION

36 CONDUCTOR MATERIAL APPLICATIONS

37 Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

1 Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

2 VFC Output Circuits Cable: Extra-flexible stranded for all sizes.

3 Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

4 PV Circuits: Copper Aluminum. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and
5 larger.

6 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

7 Service Entrance: Type XHHW-2, single conductors in raceway.

8 Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

9 Feeders Concealed in Ceilings, Walls, Partitions, and Crawspaces: Type THHN/THWN-2, single
10 conductors in raceway .

11 Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single
12 conductors in raceway.

13 Exposed Branch Circuits: Type THHN/THWN-2, single conductors in raceway .

14 Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single
15 conductors in raceway.

16 Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2,
17 single conductors in raceway.

18 Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel,
19 wire-mesh, strain relief device at terminations to suit application.

20 INSTALLATION OF CONDUCTORS AND CABLES

21 Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

22 Complete raceway installation between conductor and cable termination points according to
23 Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and
24 cables.

25 Use manufacturer-approved pulling compound or lubricant where necessary; compound used
26 must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended
27 maximum pulling tensions and sidewall pressure values.

28 Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will
29 not damage cables or raceway.

30 Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and
31 follow surface contours where possible.

32 Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

33 CONNECTIONS

34 Tighten electrical connectors and terminals according to manufacturer's published
35 torque-tightening values. If manufacturer's torque values are not indicated, use those specified in
36 UL 486A-486B.

37 Make splices, terminations, and taps that are compatible with conductor material and that
38 possess equivalent or better mechanical strength and insulation ratings than unspliced
39 conductors.

40 Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

1 Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

2 IDENTIFICATION

3 Identify and color-code conductors and cables according to Section 26 05 53 "Identification for
4 Electrical Systems."

5 Identify each spare conductor at each end with identity number and location of other end of
6 conductor, and identify as spare conductor.

7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

8 Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with
9 requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

10 FIRESTOPPING

11 Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore
12 original fire-resistance rating of assembly according to Section 07 84 13 "Penetration
13 Firestopping."

14 FIELD QUALITY CONTROL

15 Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

16 Testing Agency: Engage a qualified testing agency to perform tests and inspections.

17 Manufacturer's Field Service: Engage a factory-authorized service representative to test and
18 inspect components, assemblies, and equipment installations, including connections.

19 Perform tests and inspections with the assistance of a factory-authorized service representative.

20 Perform each of the following visual and electrical tests:

21 Insulation-resistance test on each conductor for ground and adjacent
22 conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc
23 for 600-V rated cable for a one-minute duration.

24 Cables will be considered defective if they do not pass tests and inspections.

25 Prepare test and inspection reports to record the following:

26 Procedures used.

27 Results that comply with requirements.

28 Results that do not comply with requirements, and corrective action taken to achieve
29 compliance with requirements.

30 END OF SECTION

1 SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

2
3 GENERAL

4 Summary

5 Section includes grounding systems and equipment, plus the following special applications:

6 Submittals

7 Product Data: For each type of product indicated.

8
9 PRODUCTS

10 Conductors

11 Insulated Conductors: Copperwire or cable insulated for 600 V unless otherwise required by
12 applicable Code or authorities having jurisdiction.

13 Bare Copper Conductors:

14 Solid Conductors: ASTM B 3.

15 Stranded Conductors: ASTM B 8.

16 Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.

17 Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

18 Bonding Jumper: Copper tape, braided conductors terminated with copper
19 ferrules; 1-5/8 inches wide and 1/16 inch thick.

20 Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless
21 otherwise indicated; with insulators.

22 Connectors

23 Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in
24 which used and for specific types, sizes, and combinations of conductors and other items
25 connected.

26 Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at
27 least two bolts.

28 Pipe Connectors: Clamp type, sized for pipe.

29 Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for
30 materials being joined and installation conditions.

31
32 EXECUTION

33
34 Applications

35 Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for
36 No. 6 AWG and larger unless otherwise indicated.

37 Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On
38 feeders with isolated ground, identify grounding conductor where visible to normal inspection,
39 with alternating bands of green and yellow tape, with at least three bands of green and two
40 bands of yellow.

41 Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service
42 equipment, and elsewhere as indicated.

43 Install bus on insulated spacers 1 inch minimum from wall, 6 inches above finished floor
44 unless otherwise indicated.

45 Where indicated on both sides of doorways, route bus up to top of door frame, across
46 top of doorway, and down to specified height above floor; connect to horizontal bus.

47 Conductor Terminations and Connections:

48 Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

1 Connections to Structural Steel: Welded connectors.

2 Equipment Grounding

3 Install insulated equipment grounding conductors with all feeders and branch circuits.

4 Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to
5 duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters,
6 dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to
7 air duct and connected metallic piping.

8 Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit
9 or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway
10 fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a
11 separate insulated equipment grounding conductor. Isolate conductor from raceway and from
12 panelboard grounding terminals. Terminate at equipment grounding conductor terminal of
13 the applicable derived system or service unless otherwise indicated.

14 Signal and Communication Equipment: For telephone, alarm, voice and data, and other
15 communication equipment, provide No. 6 AWG minimum insulated grounding conductor in
16 raceway from grounding electrode system to each service location, terminal cabinet, wiring
17 closet, and central equipment location.

18 Installation

19 Grounding Conductors: Route along shortest and straightest paths possible unless otherwise
20 indicated or required by Code. Avoid obstructing access or placing conductors where they may
21 be subjected to strain, impact, or damage.

22 Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance
23 except where routed through short lengths of conduit.

24 Bonding to Structure: Bond straps directly to basic structure, taking care not to
25 penetrate any adjacent parts.

26 Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install
27 bonding so vibration is not transmitted to rigidly mounted equipment.

28 Use exothermic-welded connectors for outdoor locations: if a disconnect-type
29 connection is required, use a bolted clamp.

30 Grounding and Bonding for Piping:

31 Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit,
32 from building's main service equipment, or grounding bus, to main metal water service
33 entrances to building. Connect grounding conductors to main metal water service
34 pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by
35 using one of the lug bolts of the flange. Where a dielectric main water fitting is
36 installed, connect grounding conductor on street side of fitting. Bond metal grounding
37 conductor conduit or sleeve to conductor at each end.

38 Field Quality Control

39 Perform the following tests and inspections and prepare test reports:

40 After installing grounding system but before permanent electrical circuits have been
41 energized, test for compliance with requirements.

42 Test completed grounding system at each location where a maximum ground-resistance
43 level is specified, at service disconnect enclosure grounding terminal. Make tests at
44 ground rods before any conductors are connected.

46 Measure ground resistance not less than two full days after last trace of
47 precipitation and without soil being moistened by any means other than natural
48 drainage or seepage and without chemical treatment or other artificial means of

- 1 reducing natural ground resistance.
- 2 Perform tests by fall-of-potential method according to IEEE 81.
- 3 Report measured ground resistances that exceed the following values:
- 4 Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
- 5 Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
- 6 Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
- 7 Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
- 8 Substations and Pad-Mounted Equipment: [5] <Insert value> ohms.
- 9 Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect
- 10 promptly and include recommendations to reduce ground resistance.
- 11
- 12 END OF SECTION

1 SECTION 26 0533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

2
3 GENERAL

4 Summary

5 This Section includes raceways, fittings, boxes, enclosures and cabinets for electrical wiring.

6 Definitions

7 EMT: Electrical metal tubing.

8 ENT: Electrical nonmetallic tubing.

9 FMC: Flexible metal conduit.

10 LFMC: Liquid tight flexible metal conduit.

11 RNC: Rigid nonmetallic conduit.

12 Submittals

13 Shop Drawings: For the following raceway components. Include plans, elevations, sections,
14 detail and attachments to other work.

15 Custom enclosures and cabinets.

16 For hand holes and boxes for underground wiring, including the following:

17 Duct entry provisions, including locations and duct sizes.

18 Frame and cover design.

19 Grounding details.

20 Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

21 Joint details.

22
23 PRODUCTS

24 Metal Conduit And Tubing

25 Rigid Steel Conduit: ANSI C80.1.

26 Aluminum Rigid Conduit: ANSI C80.5.

27 PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

28 Comply with NEMA RN 1.

29 Coating Thickness: 0.040 inch, minimum.

30 EMT: Comply with ANSI C80.3.

31 FMC: Zinc-coated steel.

32 LFMC: Flexible steel conduit with PVC jacket .

33 Fittings for Conduit (Including all Types and Flexible and Liquid tight), EMT and Cable: NEMA
34 FB 1; listed for type and size raceway with which used, and for application and environment in
35 which installed.

36 Fittings for EMT: Compression Gland type only, set screw not permitted.

37 Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping
38 sleeves protecting threaded joints.

39 Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies,
40 and compounded for use to lubricate and protect threaded raceway joints from corrosion and
41 enhance their conductivity.

42 Nonmetallic Conduit And Tubing

43 ENT: NEMA TC 13 .

44 RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

45 Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

1 Optical Fiber/Communications Cable Raceway And Fittings

2 Description: Comply with UL 2024; flexible type, approved for plenum riser installation.

3 Metal Wireways

4 Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 unless
5 otherwise indicated.

6 Fittings and Accessories: Include couplings, offsets, elbows, expansion joints,
7 adapters, hold-down straps, end caps, and other fittings to match and mate with
8 wireways as required for complete system.

9 Wireway Covers: Hinged type.

10 Finish: Manufacturer's standard enamel finish.

11 Surface Raceways

12 Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's
13 standard enamel finish in color selected by Architect.

14 Manufacturers: Subject to compliance with requirements, provide products
15 by one of the following:

16 Thomas & Betts Corporation.

17 Walker Systems, Inc.: Wiremold Company (The).

18 Boxes, Enclosures, And Cabinets

19 Sheet Metal Outlet and Device Boxes: NEMA OS 1 .

20 Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy Type FD, with gasketed
21 cover.

22 Nonmetallic Outlet and Device Boxes: NEMA OS 2 .

23 Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

24 Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1 galvanized, cast iron with
25 gasketed cover.

26 Hinged-Cover Enclosures: NEMA 250, Type 1 with continuous-hinge cover with flush
27 latch unless otherwise indicated.

28 Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

29 Cabinets:

30 NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front,
31 finished inside and out with manufacturer's standard enamel.

32 Hinged door in front cover with flush latch and concealed hinge.

33 Key latch to match panelboards.

34 Metal barriers to separate wiring of different systems and voltage.

35 Accessory feet where required for freestanding equipment.

36 Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and
37 aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a
38 combination of the two.

39 Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and
40 aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a
41 combination of the two.

42 Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers
43 of fiberglass.

44 Sleeves For Raceways

45 Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel,
46 plain ends.

47 Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron
48 pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

1
2
3 Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or
4 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.
5 Coordinate sleeve selection and application with selection and application of
6 firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."
7

8 EXECUTION

9 Raceway Application

10 Outdoors: Apply raceway products as specified below unless otherwise
11 indicated:

12 Exposed Conduit: Rigid steel conduit.

13 Concealed Conduit, Aboveground: Rigid steel conduit.

14 Underground Conduit: RNC, Type EPC-40-PVC or 80-PVC, direct buried, unless noted to be
15 concrete-encased on drawings.

16 Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric
17 Solenoid, or Motor-Driven Equipment): LFMC.

18 Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4.

19 Comply with the following indoor applications, unless otherwise indicated:

20 Exposed, Not Subject to Physical Damage: EMT.

21 Exposed, Not Subject to Severe Physical Damage: EMT.

22 Exposed and Subject to Severe Physical Damage: Rigid steel conduit.

23 Includes raceways in the following locations:

24 Loading dock.

25 Corridors used for traffic of mechanized carts, forklifts, and
26 pallet-handling units.

27 Mechanical rooms.

28 Concealed in Ceilings and Interior Walls and Partitions: EMT.

29 Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric
30 Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.

31 Damp or Wet Locations: Rigid steel conduit.

32 Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel
33 in damp or wet locations.

34 Minimum Raceway Size: 3/4-inch trade size.

35 Raceway Fittings: Compatible with raceways and suitable for use and location.

36 Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated.

37 PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material.

38 Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings.

39 Use sealant recommended by fitting manufacturer.

40 Do not install aluminum conduits in contact with concrete.

41 Installation

42 Comply with NECA 1 for installation requirements applicable to products
43 specified in Part 2 except where requirements on Drawings or in this article are
44 stricter.

45 Keep raceways at least 6 inches away from parallel runs of flues and steam or
46 hot-water pipes. Install horizontal raceway runs above water and steam piping.

47 Complete raceway installation before starting conductor installation.

48 Arrange stub-ups so curved portions of bends are not visible above finished slab.

1 Install no more than the equivalent of three 90-degree bends in any conduit run except
2 for communications conduits, for which fewer bends are allowed.

3 Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise
4 indicated.

5 Support conduit within 12 inches of enclosures to which attached.

6 Raceways Embedded in Slabs:

7 Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement.

8 Where at right angles to reinforcement, place conduit close to slab support.

9 Arrange raceways to cross building expansion joints at right angles with expansion fittings.

10 Change from ENT to rigid steel conduit before rising above the floor. Utilize rigid elbows.

11 Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply
12 listed compound to threads of raceway and fittings before making up joints. Follow compound
13 manufacturer's written instructions.

14 Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings
15 to protect conductors including conductors smaller than No. 4 AWG.

16 Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not
17 less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

18 Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and
19 nonmetallic, rigid and flexible, as follows:

20 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.

21 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.

22 Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless
23 Drawings show stricter requirements. Separate lengths with pull or junction boxes or
24 terminations at distribution frames or cabinets where necessary to comply with these
25 requirements.

26 Install raceway sealing fittings at accessible locations and fill them with listed sealing compound.
27 For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a
28 finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the
29 following points:

30 Where conduits pass from warm to cold locations, such as boundaries of
31 refrigerated spaces.

32 Where otherwise required by NFPA 70.

33 Flexible Conduit Connections: Use a maximum of 72 inches of flexible conduit for semi
34 recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and
35 for transformers and motors.

36 Use LFMC in damp or wet locations subject to severe physical damage.

37 Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

38 Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block,
39 and install box flush with surface of wall.

40 Set metal floor boxes level and flush with finished floor surface.

41 Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

42 Installation Of Underground Conduit

43 Direct Bury Conduit.

44 Install conduits a minimum of 24 inches below finished grade.

45 Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench
46 bottom as specified in Division 2 Section "Earthwork" for pipe less than 6 inches in nominal
47 diameter.

48 Install backfill as specified in Section 312000 "Earthwork."

1 After installing conduit, backfill and compact. Start at tie-in point, and work toward end of
2 conduit run, leaving conduit at end of run free to move with expansion and contraction as
3 temperature changes during this process. Firmly hand tamp backfill around conduit to provide
4 maximum supporting strength. After placing controlled backfill to within 12 inches of finished
5 grade, make final conduit connection at end of run and complete backfilling with normal
6 compaction as specified in Division 2 Section "Earthwork ."

7 Retain one of first two subparagraphs below to specify type of stub-up for direct-buried
8 conduits in Project.

9 Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at
10 building entrances through floor.

11 Couple steel conduits to ducts with adapters designed for this purpose, and encase
12 coupling with 3 inches of concrete.

13 For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit
14 horizontally a minimum of 60 inches from edge of equipment pad or foundation.

15 Install insulated grounding bushings on terminations at equipment.

16 Warning Planks: Bury warning planks approximately 12 inches above
17 direct-buried conduits, placing them 24 inches (600mm) o.c.

18 Sleeve-Seal Installation

19 Install to seal underground, exterior wall penetrations.

20 Use type and number of sealing elements recommended by manufacturer for
21 raceway material and size. Position raceway in center of sleeve. Assemble
22 mechanical sleeve seals and install in annular space between raceway and sleeve.

23 Tighten bolts against pressure plates that cause sealing elements to expand and make
24 watertight seal.

25 Firestopping

26 Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore
27 original fire-resistance rating of assembly. Firestopping materials and installation
28 requirements are specified in Division 7 Section "Through -Penetration Firestop Systems."

29 Protection

30 Provide final protection and maintain conditions that ensure coatings, finishes and cabinets are
31 without damage or deterioration at time of Substantial Completion.

32 Repair damage to galvanized finishes with zinc-rich paint recommended by
33 manufacturer.

34 Repair damage to PVC coatings or paint finishes with matching touchup coating
35 recommended by manufacturer.

36
37 END OF SECTION

1 SECTION 26 0548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

2
3 GENERAL

4 Related Documents

5 Drawings and general provisions of the Contract, including General and Supplementary
6 Conditions and Division 01 Specification Sections, apply to this Section.

7 Definitions

8 The IBC: International Building Code.

9 ICC-ES: ICC-Evaluation Service.

10 OSHPD: Office of Statewide Health Planning and Development for the State of California.

11 Performance Requirements For Century Tower

12 Seismic-Restraint Loading:

13 Site Class as Defined in the IBC: C.

14 Occupancy Category: IV

15 Component Importance Factor: 1.5.

16 Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.238.

17 Design Spectral Response Acceleration at 1.0-Second Period: 0.070.

18 Quality Assurance

19 Comply with seismic-restraint requirements in the IBC unless requirements in this Section are
20 more stringent.

21 Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural
22 Welding Code - Steel."

23 Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall
24 bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval
25 by another agency acceptable to authorities having jurisdiction, showing maximum
26 seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based
27 on calculations. If preapproved ratings are not available, submittals based on independent
28 testing are preferred. Calculations (including combining shear and tensile loads) to support
29 seismic-restraint designs must be signed and sealed by a qualified professional engineer.

30 Comply with NFPA 70.

31
32
33 PRODUCTS

34 Vibration Isolators

35 Available Manufacturers: Subject to compliance with requirements, manufacturers offering
36 products that may be incorporated into the Work include, but are not limited to, the following:

37 Manufacturers: Subject to compliance with requirements, provide products by one of the
38 following:

39 Seismic-Restraint Devices

40 Available Manufacturers: Subject to compliance with requirements, manufacturers offering
41 products that may be incorporated into the Work include, but are not limited to, the following:

42 Manufacturers: Subject to compliance with requirements, provide products by one of the
43 following:

44 General Requirements for Restraint Components: Rated strengths, features, and application
45 requirements shall be as defined in reports by an agency acceptable to authorities having
46 jurisdiction.

47 Structural Safety Factor: Allowable strength in tension, shear, and pullout force of
48 components shall be at least four times the maximum seismic forces to which they will

1 be subjected.

2
3 EXECUTION

4 Examination

5 Examine areas and equipment to receive seismic-control devices for compliance with
6 requirements for installation tolerances and other conditions affecting performance.

7 Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before
8 installation.

9 Proceed with installation only after unsatisfactory conditions have been corrected.

10 Applications

11 Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps
12 approved for application by an agency acceptable to authorities having jurisdiction.

13 Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of
14 components so strength will be adequate to carry present and future static and seismic loads
15 within specified loading limits.

16 Seismic-Restraint Device Installation

17 Equipment and Hanger Restraints:

18 Install seismic-restraint devices using methods approved by an agency acceptable to
19 authorities having jurisdiction providing required submittals for component.

20 Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at
21 flanges of beams, at upper truss chords of bar joists, or at concrete members.

22 Accommodation Of Differential Seismic Motion

23 Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways
24 where they cross seismic joints, where adjacent sections or branches are supported by different
25 structural elements, and where they terminate with connection to equipment that is anchored
26 to a different structural element from the one supporting them as they approach equipment.

27
28 END OF SECTION

1 SECTION 26 0800 - ELECTRICAL SYSTEMS COMMISSIONING REQUIREMENTS

2
3 GENERAL

4
5 Description

6 The purpose of this section is to specify responsibilities of this Division for participating in the
7 commissioning process as directed by the CxA.

8 The equipment and systems to be commissioned are listed in Division 1, Section 01 9100.

9 Commissioning requires the participation of this Division to ensure that all systems are operating in
10 a manner consistent with the Contract Documents. The general commissioning requirements and
11 coordination are detailed in Section 01 9100. This Division shall be familiar with all parts of Division
12 1 as well as the Commissioning Plan issued by the CxA, and shall execute all commissioning
13 responsibilities assigned to them in the Contract Documents.

14 The following are common abbreviations used in these specifications and the *Commissioning Plan*.

15	A/E	Architect and Design Engineers	FPT	Functional Performance Test
16	CC	Controls Contractor	GC	General Contractor (Prime)
17	CM	APS Construction Manager	MC	Mechanical Contractor
18	Cx	Commissioning	OR	Owner's Representative*
19	CxA	Commissioning Authority	PFC	Prefunctional Checklist
20	Cx Plan	Commissioning Plan Document	Subs	Subcontractors to General
21	EC	Electrical Contractor	TAB	Test and Balance Contractor

22 *Normally APS Staff Architect or Construction Manager

23
24 Definitions

25 Refer to Section 01 9100.

26
27 Responsibilities

28 Electrical Contractors (EC). The commissioning responsibilities applicable to the Electrical
29 Contractor are as follows (*all references apply to commissioned equipment only*):

30 Include the cost of commissioning participation in the contract price.

31 In each purchase order or subcontract written, include Cx requirements for submittal data, Cx
32 documentation, O&M data and training.

33 Attend a commissioning scoping meeting (Cx 'Kickoff') and other necessary meetings scheduled by
34 the CxA to facilitate the Cx process.

35 Provide normal cut sheets and shop drawing submittals of commissioned equipment to the CxA.

36 Provide additional requested documentation to the CxA for development of startup and functional
37 testing procedures.

38 Typically this will include detailed manufacturer installation/startup instructions,
39 operating, troubleshooting and maintenance procedures, full details of any owner-
40 contracted tests, full factory testing reports (if any) and full warranty information,
41 including all responsibilities of the Owner to keep the warranty in force. In addition,
42 the installation and checkout materials that are shipped with the equipment, as well
43 as the actual field checkout sheet forms to be used by the factory or field
44 technicians, shall be submitted to the CxA.

45 The CxA may request further documentation necessary for the commissioning
46 process.

47 This data request may be made prior to normal submittals.

- 1 Provide a copy of the O&M manual submittals for commissioned equipment, through normal
 2 channels, to the CxA for review and approval.
 3 Assist the CxA in developing a full startup and initial checkout plan using manufacturer's detailed
 4 startup procedures and/or the prefunctional checklists (PFCs) provided by the CxA. Both the
 5 Contractor and CxA must agree on this plan prior to equipment startup.
 6 Provide assistance to the CxA in preparing the specific functional performance test procedures.
 7 Sub(s) shall review test procedures to ensure feasibility, safety and equipment protection, and
 8 provide necessary written alarm limits to be used during the tests.
 9 Assist (along with the design engineers) in clarifying the operation and control of commissioned
 10 equipment in areas where the equipment documentation, specifications and/or control drawings
 11 are not sufficient for writing detailed testing procedures.
 12 Provide skilled technicians to execute starting of equipment and to execute the functional
 13 performance tests. Ensure that they are available and present during the agreed upon schedules
 14 and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
 15 During the startup and initial checkout process, execute and document the electrical-related
 16 portions of the PFCs provided by the CxA for all commissioned equipment.
 17 Perform and clearly document all completed startup and system operational checkout procedures,
 18 providing a copy to the CxA.
 19 Address current A/E punch list items before functional testing.
 20 Perform functional performance testing under the direction of the CxA for specified equipment.
 21 Assist the CxA in interpreting the monitoring data, as necessary.
 22 Correct deficiencies (differences between specified and observed performance) as interpreted by
 23 the CxA, CM and A/E and retest the equipment.
 24 Prepare O&M manuals according to the Contract Documents, including clarifying and updating the
 25 original sequences of operation to as-built conditions.
 26 Prepare red-line as-builts for all relevant drawings, and final as-builts for contractor-generated
 27 coordination drawings.
 28 Provide training of the Owner's operating personnel as specified.
 29 Coordinate with equipment manufacturers to determine specific requirements to maintain the
 30 validity of the warranty.
 31 Support seasonal or deferred functional performance testing by the CxA as required.

32 PRODUCTS

33 Test Equipment

34 Contractor is to provide all tools, equipment and instrumentation required to test electrical
 35 systems per the Cx Plan.

36 EXECUTION

37 Submittals

38 Division shall provide submittal documentation relative to commissioned systems as requested by
 39 the CxA.

40 Startup

41 The Electrical Contractor shall follow the startup and initial checkout procedures listed in 1.3
 42 'Responsibilities' of this section, as well as in Section 01 9100. Contractor has startup responsibility
 43 and is required to complete systems and sub-systems so they are fully functional, meeting the
 44 design objectives of the Contract Documents. The acts of participating in the commissioning process
 45
 46
 47

1 and performing functional testing do not relieve, lessen or shift Contractor's responsibility for
2 providing such a result.

3 Functional testing is intended to begin upon completion of a system's installation. Functional
4 testing may proceed prior to the completion of a system or sub-system at the discretion of the CxA
5 and CM. Beginning system testing before completion does not relieve the Contractor from fully
6 completing the system, nor from completion of PFCs for that system.

7 Functional Performance Tests

8 Refer to Section 01 9100 for a list of systems to be commissioned and for details of the Functional
9 Performance Testing process.

10 Documentation, Non-Conformance And Approvals

11 Refer to Section 01 9100 for specific details on non-conformance issues relating to
12 Prefunctional Checklists.

13 Refer to Section 01 9100 for details on deficiencies and non-conformance issues relating to
14 Functional Performance Tests.

15 Operations And Maintenance (O&M) Manuals

16 Compile and prepare documentation for all equipment and systems covered in this Division
17 and deliver to the GC for inclusion in the O&M manuals, according to Division 1.

18 Approval of the commissioning related sections of the O&M manuals shall be made by the
19 A/E and by the CxA. Refer to Division 1.

20 Training Of Owner Personnel

21 The GC shall be responsible for training coordination and scheduling and ultimately for
22 ensuring that training is completed. Refer to Section Division 1 for additional details.

23 The CxA shall be responsible for overseeing and approving the content and adequacy of the
24 training of Owner personnel for commissioned equipment. Refer to Division 1 for additional
25 details.

26 Electrical Contractor (EC). The electrical contractor shall have the following training
27 responsibilities:

28 Provide the CxA with a training plan two weeks before the planned training
29 according to the outline described in Section 01 9100.

30 Provide designated Owner personnel with comprehensive training in the
31 understanding of their systems and the operation and maintenance of each
32 commissioned electrical system or major piece of electrical equipment.

33 Training shall normally start with classroom sessions followed by hands-on training
34 on each piece of equipment, illustrating the various modes of operation as well as
35 alarms, power failure, resets, etc.

36 During any demonstration, should the system fail to perform in accordance with the
37 requirements of the O&M manual or sequence of operations, the system will be
38 repaired or adjusted as necessary and the demonstration repeated.

39 Trainer(s) for electrical systems shall possess practical building operating expertise
40 as well as in-depth knowledge of all modes of operation for their specific piece(s) of
41 equipment. Trainers may include the startup technician, installing contractor
42 and/or manufacturer's representative. More than one party may be required to
43 execute the training.

44 Training sessions shall follow the outline in the Table of Contents of the Operation
45 and Maintenance manual, and illustrate whenever possible the use of the O&M
46 manual as a practical reference.

47 The format and training agenda described in *The HVAC Commissioning Process*,
48 *ASHRAE Guideline 0* is recommended.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

Training shall include:

Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.

A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions.

Discussion of relevant health and safety issues and concerns.

Discussion of warranties and guarantees.

Common troubleshooting problems and solutions.

Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.

Discussion of any peculiarities of equipment installation or operation.

Classroom sessions shall include the use of visual aids as appropriate.

Hands-on training shall include startup, operation in all modes possible, including manual, shut-down and any emergency procedures, plus preventative maintenance for all pieces of equipment.

Training shall occur after functional testing is complete, unless approved otherwise by the Project Manager.

Deferred Testing

Refer to Section 01 9100 for requirements of deferred testing.

Written Work Products

Written work products of Contractors will consist of the startup and initial checkout plans described in Section 01 9100 and the filled out startup and Prefunctional Checklists (PFCs), plus O&M documentation as required.

END OF SECTION

1 SECTION 26 24 13 - SWITCHBOARDS

2
3 GENERAL

4
5 SUMMARY

6 Section Includes:

7 Service and distribution switchboards rated 600 V and less.

8 Transient voltage suppression devices.

9 Disconnecting and overcurrent protective devices.

10 Instrumentation.

11 Control power.

12 Accessory components and features.

13 Identification.

14
15 DEFINITIONS

16
17 EMI: Electromagnetic interference.

18 GFCI: Ground-fault circuit interrupter.

19 RFI: Radio-frequency interference.

20 RMS: Root mean square.

21 SPDT: Single pole, double throw..

22
23 PERFORMANCE REQUIREMENTS

24
25 Seismic Performance: Switchboards shall withstand the effects of earthquake motions
26 determined according to SEI/ASCE 7.

27 The term "withstand" means "the unit will remain in place without separation of any
28 parts from the device when subjected to the seismic forces specified.

29
30 SUBMITTALS

31
32 Product Data: For each type of switchboard, overcurrent protective device, transient voltage
33 suppression device, ground-fault protector, accessory, and component indicated. Include
34 dimensions and manufacturers' technical data on features, performance, electrical
35 characteristics, ratings, accessories, and finishes.

36 Shop Drawings: For each switchboard and related equipment.

37 Dimensioned plans, elevations, sections, and details, including required clearances and
38 service space around equipment. Show tabulations of installed devices, equipment
39 features, and ratings. Include the following:

40 Enclosure types and details for types other than NEMA 250, Type 1.

41 Bus configuration, current, and voltage ratings.

42 Short-circuit current rating of switchboards and overcurrent protective devices.

43 Retain first subparagraph below if optional barriers are specified.

44 Include descriptive documentation of optional barriers specified for electrical
45 insulation and isolation.

46 Detail utility company's metering provisions with indication of approval by utility
47 company.

48 Listing for series rating of installed devices.

1 Retain first subparagraph below if series rating of overcurrent protective devices
2 is used.

3 Features, characteristics, ratings, and factory settings of individual overcurrent
4 protective devices and auxiliary components.

5 Retain first subparagraph below if final system short-circuit and coordination
6 studies will be performed by designer or assigned to independent consultant.

7 These curves are also beneficial to Owner for future additions or reevaluations of
8 settings of overcurrent protective devices.

9 Include time-current coordination curves for each type and rating of overcurrent
10 protective device included in switchboards. Submit on translucent log-log graph
11 paper; include selectable ranges for each type of overcurrent protective device.

12 Wiring Diagrams: Power, signal, and control wiring.

13 Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity
14 and locate and describe mounting and anchorage provisions.

15 Detailed description of equipment anchorage devices on which the certification
16 is based and their installation requirements.

17 Field Quality-Control test reports including the following:

18 Test procedures used.

19 Test results that comply with requirements.

20 Results of failed tests and corrective action taken to achieve test results that
21 comply with requirements.

22 Operation and Maintenance Data: For switchboards and components to include in emergency,
23 operation, and maintenance manuals.

24 Routine maintenance requirements for switchboards and all installed components.

25 Manufacturer's written instructions for testing and adjusting overcurrent
26 protective devices.

27 Time-current curves, including selectable ranges for each type of overcurrent
28 protective device.

30 QUALITY ASSURANCE

31
32 Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and
33 trained in electrical safety as required by NFPA 70E.

34 Source Limitations: Obtain switchboards, overcurrent protective devices, components,
35 and accessories from single source from single manufacturer.

36 Product Selection for Restricted Space: Drawings indicate maximum dimensions for
37 switchboards including clearances between switchboards and adjacent surfaces and
38 other items. Comply with indicated maximum dimensions.

39 Electrical Components, Devices, and Accessories: Listed and labeled as defined in
40 NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction,
41 and marked for intended use.

42 Comply with NEMA PB 2, "Deadfront Distribution Switchboards."

43 Comply with NFPA 70.

45 DELIVERY, STORAGE, AND HANDLING

46
47 Deliver in sections or lengths that can be moved past obstructions in delivery path.

48 Store indoors in clean dry space with uniform temperature to prevent condensation.

1 Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.
2 Handle switchboards according to NEMA PB 2.1 and NECA 400.
3

4 PROJECT CONDITIONS

5

6 Environmental Limitations:

7 Do not deliver or install switchboards until spaces are enclosed and weathertight, wet
8 work in spaces is complete and dry, work above switchboards is complete, and
9 temporary HVAC system is operating and maintaining ambient temperature and
10 humidity conditions at occupancy levels during the remainder of the construction
11 period.

12 Rate equipment for continuous operation under the following conditions
13 unless otherwise indicated:

14 Ambient Temperature: Not exceeding 104 deg F.

15 Altitude: Not exceeding 5600 feet.
16

17 COORDINATION

18

19 Coordinate layout and installation of switchboards and components with other construction
20 including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace
21 clearances and required clearances for equipment access doors and panels.

22 Coordinate sizes and locations of concrete bases with actual equipment provided.

23 Concrete, reinforcement, and formwork requirements are specified with concrete.
24

25 EXTRA MATERIALS

26

27 Furnish extra materials described below that match products installed and that are packaged
28 with protective covering for storage and identified with labels describing contents:

29 Potential Transformer Fuses: Equal to 10 percent of amount installed for each size and
30 type, but no fewer than 2 of each size and type.

31 Control-Power Fuses: Equal to 10 percent of amount installed for each size
32 and type, but no fewer than 2 of each size and type.

33 Fuses for Fused Switches: Equal to 10 percent of amount installed for each
34 size and type, but no fewer than 3 of each size and type.

35 Indicating Lights: Equal to 10 percent of amount installed for each size and
36 type, but no fewer than 1 of each size and type.
37

38 PRODUCTS

39

40 MANUFACTURED UNITS

41

42 Manufacturers: Subject to compliance with requirements, provide products by one of the
43 following manufacturers:

44 Eaton Electrical Inc.; Cutler-Hammer Products..

45 General Electric Company; Electrical Distribution & Protection Div.

46 Siemens Energy & Automation, Inc.

47 Square D

- 1 Front-Connected, Front-Accessible Switchboard: Fixed, individually mounted main device,
 2 panel-mounted branches, and sections rear aligned.
- 3 Main Devices: Fixed, individually mounted.
 4 Branch Devices: Fixed, individually mounted.
- 5 Retain first two paragraphs below if rating data are not on Drawings. Nominal System Voltage:
 6 As indicated on drawings.
- 7 Main-Bus Continuous: As indicated on drawings.
 8 Indoor Enclosures: Steel, NEMA 250, Type 1.
 9 Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard
 10 gray finish over a rust-inhibiting primer on treated metal surface.
 11 Outdoor Enclosures: Type 3R.
 12 Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated
 13 with corrosion-resistant undercoating.
 14 Enclosure: Downward, rearward sloping roof; bolt-on rear covers for each
 15 section, with provisions for padlocking.
- 16 Barriers: Between adjacent switchboard sections.
 17 Designer Note: Heaters and controls below, usually specified for outdoor
 18 switchboards, are sometimes specified for indoor units. Designer Note: Hinged Front
 19 Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
- 20 Pull Box on Top of Switchboard:
 21 Adequate ventilation to maintain temperature in pull box within same limits as
 22 switchboard.
 23 Removable covers shall form top, front, and sides. Top covers at rear shall be
 24 easily removable for drilling and cutting.
 25 Bottom shall be insulating, fire-resistive material with separate holes for cable
 26 drops into switchboard.
 27 Cable supports shall be arranged to facilitate cabling and adequate to support
 28 cables indicated, including those for future installation.
- 29 Buses and Connections: Three phase, four wire unless otherwise indicated.
 30 Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity or
 31 tin-plated, high-strength, electrical-grade aluminum alloy.
 32 If bus is aluminum, use copper- or tin-plate aluminum for circuit-breaker line
 33 connections.
 34 If bus is copper, use copper for feeder circuit-breaker line connections.
- 35 Ground Bus: 1/4-by-2-inch Minimum-size hard-drawn copper of 98 percent
 36 conductivity, equipped with pressure connectors for feeder and branch-circuit ground
 37 conductors. For busway feeders, extend insulated equipment grounding cable to
 38 busway ground connection and support cable at intervals in vertical run.
 39 Contact Surfaces of Buses: Silver plated.
 40 Main Phase Buses, Neutral Buses and Equipment Ground Buses: Uniform
 41 capacity for entire length of switchboard's main and distribution sections.
 42 Provide for future extensions from both ends.
 43 Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
 44 Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise
 45 indicated, equipped with pressure connectors for outgoing circuit neutral
 46 cables. Bus extensions for busway feeder neutral bus are braced.
- 47 Future Devices: Equip compartments with mounting brackets, supports, bus connections, and
 48 appurtenances at full rating of circuit-breaker compartment.

1
2 OVERCURRENT PROTECTIVE DEVICES
3

4 Molded-Case Circuit Breaker: NEMA AB 3, with interrupting capacity to meet available fault
5 currents.

6 Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level
7 overloads, and instantaneous magnetic trip element for short circuits. Adjustable
8 magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

9 Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with
10 front-mounted, field-adjustable trip setting.

11 Electronic trip circuit breakers with RMS sensing; field-replaceable rating plug
12 or field-replaceable electronic trip; and the following field-adjustable settings:

13 Instantaneous trip.

14 Long- and short-time pickup levels.

15 Long- and short-time time adjustments.

16 Ground-fault pickup level, time delay, and I^2t response.

17 External handle shall be suitable for locking in the OFF position.

18 Silver alloy contacts with auxiliary arc-quenching device.

19 GFCI Circuit Breakers: Single- and two-pole configurations with 5 mA trip
20 sensitivity.

21 Main circuit breaker shall be UL listed for continuous operation at 100% rated
22 load.

23 Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and
24 number of poles.

25 Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.

26 Application Listing: Appropriate for application; Type SWD for switching
27 fluorescent lighting loads; Type HACR for heating, air-conditioning, and
28 refrigerating equipment.

29 Ground-Fault Protection: Integrally mounted relay and trip unit with
30 adjustable pickup and time-delay settings, push-to-test feature, and
31 ground-fault indicator.

32 Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75
33 percent of rated voltage.

34 Enclosed, Insulated-Case Circuit Breaker: Amperage and interrupting capacity as indicated on
35 drawings.

36 Fixed circuit-breaker mounting.

37 Two-step, stored-energy closing.

38 Microprocessor-based trip units with interchangeable rating plug, LED trip
39 indicators, and the following field-adjustable settings:

40 Instantaneous trip.

41 Long- and short-time pickup levels.

42 Long- and short-time adjustments with I^2t response

43 Ground-fault pickup level, time delay, and I^2t response.

44 Remote trip indication and control.

45 Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking
46 ground-fault protection function.

47 Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified uses.

48 Quick-make, quick-Break, dead-front type. Each switch shall be a self-contained unit,

1 externally operated from the front.

2 Fuse and switch compartment with defeat able interlock to prevent access with
3 switch in the 'ON' position.

4 Switches shall be equipped with rejection type clips suitable for UL Class R
5 fuses up to 600A, Suitable for UL class L fuses above 600A.

6 Handle shall be capable of being padlocked in the OFF position.

7 Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

8 9 INSTRUMENTATION

10
11 Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:

12 Potential Transformers: Secondary voltage rating of 120 V and NEMA accuracy class of
13 0.3 with burdens of W, X and Y.

14 Current Transformers: Ratios shall be as indicated with accuracy class and
15 burden suitable for connected relays, meters and instruments.

16 Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or
17 four-wire systems and with the following features:

18 Switch-selectable digital display of the following values with maximum accuracy
19 tolerances as indicated:

20 Phase Currents, Each Phase: Plus or minus 1 percent.

21 Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.

22 MegaVARs: Plus or minus 2 percent.

23 Power Factor: Plus or minus 2 percent.

24 Frequency: Plus or minus 0.5 percent.

25 MegaWatt Demand: Plus or minus 2 percent; demand interval programmable
26 from five to 60 minutes.

27 Accumulated Energy, MegaWatt-Hours: Plus or minus 2 percent;
28 accumulated values unaffected by power outages up to 72 hours.

29 Mounting: Display and control unit flush or semi-flush mounted in instrument
30 compartment door.

31 Ammeters, Voltmeters, and Power-Factor Meters: ANSI C39.1.

32 Meters: 4-inch diameter or 6 inches square flush or semi-flush, with anti-parallax
33 250-degree scales and external zero adjustment.

34 Voltmeters: Cover an expanded-scale range of nominal voltage plus 10
35 percent.

36 Instrument Switches: Rotary type with off position.

37 Voltmeter Switches: Permit reading of all phase-to-phase voltages and, where a
38 neutral is indicated, phase-to-neutral voltages.

39 Ammeter Switches: Permit reading of current in each phase and maintain
40 current-transformer secondaries in a closed-circuit condition at all times.

41 42 CONTROL POWER

43
44 Control Circuits: 120-V ac, supplied through secondary disconnecting devices from
45 control-power transformer.

46 Control-Power Fuses: Primary and secondary fuses for current-limiting and overload
47 protection of transformer and fuses for protection of control circuits.

48 Control Wiring: Factory installed, with bundling, lacing, and protection included.

1 Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges,
2 and for conductors for interconnections between shipping units.
3

4 ACCESSORY COMPONENTS AND FEATURES

5

6 Furnish portable test set to test functions of solid-state trip devices without removal from
7 switchboard. Include relay and meter test plugs suitable for testing switchboard meters and
8 switchboard class relays.

9 Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel
10 box or cabinet. Arrange for wall mounting.
11

12 IDENTIFICATION

13

14 Service Equipment Label: NRTL labeled for use as service equipment for switchboards with
15 one or more service disconnecting and overcurrent protective devices.
16

17 EXECUTION

18

19 PROTECTION

20

21 Temporary Heating: Apply temporary heat to maintain temperature according to
22 manufacturer's written instructions.
23

24 EXAMINATION

25

26 Receive, inspect, handle, and store switchboards according to NECA 400 and NEMA PB 2.1.

27 Examine switchboards before installation. Reject switchboards that are moisture
28 damaged or physically damaged.

29 Examine elements and surfaces to receive switchboards for compliance with installation
30 tolerances and other conditions affecting performance.

31 Proceed with installation only after unsatisfactory conditions have been corrected.
32

33 INSTALLATION

34

35 Install switchboards and accessories according to NEMA PB 2.1 and NECA 40.

36 Install and anchor switchboards level on concrete bases, 4-inch nominal thickness.

37 Install dowel rods to connect concrete base to concrete floor. Unless otherwise
38 indicated, install dowel rods on 18-inch centers around the full perimeter of concrete
39 base.

40 For switchboards, install epoxy-coated anchor bolts that extend through
41 concrete base and anchor into structural concrete floor.

42 Place and secure anchorage devices. Use setting drawings, templates,
43 diagrams, instructions, and directions furnished with items to be embedded.

44 Install anchor bolts to elevations required for proper attachment to
45 switchboards.

46 Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and
47 temporary blocking of moving parts from switchboard units and components.

48 Operating Instructions: Frame and mount the printed basic operating instructions for

- 1 switchboards, including control and key interlocking sequences and emergency
2 procedures. Fabricate frame of finished wood or metal and cover instructions with
3 clear acrylic plastic. Mount on front of switchboards.
4 Install overcurrent protective devices, transient voltage suppression devices, and
5 instrumentation.
6 Set field-adjustable switches and circuit-breaker trip ranges.
7 Install spare-fuse cabinet.

8 9 IDENTIFICATION

- 10
11 Identify field-installed conductors, interconnecting wiring, and components; provide warning
12 signs as specified in Section "Electrical Identification" or as indicated on drawings.
13 Switchboard Nameplates: Label each switchboard compartment with engraved metal
14 or laminated-plastic nameplate mounted with corrosion-resistant screws.
15 Device Nameplates: Label each disconnecting and overcurrent protective device and
16 each meter and control device mounted in compartment doors with a nameplate
17 complying with requirements for identification specified in Section "Electrical
18 Identification".
19

20 FIELD QUALITY CONTROL

- 21
22 Perform tests and inspections.
23 Acceptance Testing Preparation:
24 Test insulation resistance for each switchboard bus, component, connecting supply,
25 feeder, and control circuit.
26 Test continuity of each circuit.
27 Tests and Inspections:
28 Perform each visual and mechanical inspection and electrical test stated in NETA
29 Acceptance Testing Specification. Certify compliance with test parameters. Correct
30 malfunctioning units on-site, where possible, and retest to demonstrate compliance;
31 otherwise, replace with new units and retest.
32 Switchboard will be considered defective if it does not pass tests and inspections.
33 Prepare test and inspection reports, including a certified report that identifies
34 switchboards included and that describes scanning results. Include notation of
35 deficiencies detected, remedial action taken and observations after remedial action.
36

37 ADJUSTING

- 38
39 Adjust moving parts and operable components to function smoothly, and lubricate as
40 recommended by manufacturer.
41 Set field-adjustable circuit-breaker trip ranges as specified in Section "Overcurrent
42 Protective Device Coordination."
43

44 PROTECTION

- 45
46 Temporary Heating: Apply temporary heat, to maintain temperature according to
47 manufacturer's written instructions, until switchboard is ready to be energized and placed into
48 service.

1 CLEANING

2

3

4

5

6

7

DEMONSTRATION

8

9

10

11

12

END OF SECTION

On completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories. Refer to Section "Demonstration and Training."

1 SECTION 26 24 16 - PANELBOARDS

2

3 GENERAL

4

5 SUMMARY

6

7 This Section includes the following:

8 Distribution panelboards.

9 Lighting and appliance branch-circuit panelboards.

10

11 DEFINITIONS

12

13 EMI: Electromagnetic interference.

14 GFCI: Ground-fault circuit interrupter.

15 RFI: Radio-frequency interference.

16 RMS: Root mean square.

17 SPDT: Single pole, double throw.

18

19 SUBMITTALS

20

21 Product Data: For each type of panelboard, switching and overcurrent protective device,
 22 transient voltage suppression device, accessory, and component indicated. Include dimensions
 23 and manufacturers' technical data on features, performance, electrical characteristics, ratings,
 24 and finishes.

25 Shop Drawings: For each panelboard and related equipment.

26 Show tabulations of installed devices, equipment features, and ratings. Include the
 27 following:

28 Enclosure types and details for types other than NEMA 250, Type 1.

29 Bus configuration, current, and voltage ratings.

30 Short-circuit current rating of panelboards and overcurrent protective devices.

31 Retain first subparagraph below if series rating of overcurrent protective devices
 32 is used. Include evidence of NRTL listing for series rating of installed devices.

33 Features, characteristics, ratings, and factory settings of individual overcurrent
 34 protective devices and auxiliary components.

35 Label designation for each panelboard.

36

37 Panelboard Schedules: For installation in panelboards. Submit final versions after load
 38 balancing.

39 Operation and Maintenance Data: For panelboards and components to include in emergency,
 40 operation, and maintenance manuals.

41 Manufacturer's written instructions for testing and adjusting overcurrent protective
 42 devices.

43 Time-current curves, including selectable ranges for each type of overcurrent protective
 44 device.

1
2 QUALITY ASSURANCE
3

4 Source Limitations: Obtain panelboards, overcurrent protective devices, components, and
5 accessories from single source from single manufacturer.

6 Product Options: Drawings indicate size, profiles and dimensional requirements of
7 panelboards and are based on the specific system indicated. Refer to Division 1 Section
8 "Product Requirements."

9 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70,
10 Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for
11 intended use.

12 Comply with NEMA PB 1.

13 Comply with NFPA 70.
14

15 PROJECT CONDITIONS
16

17 Environmental Limitations:

18 Do not deliver or install panelboards until spaces are enclosed and weathertight, wet
19 work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC
20 system is operating and maintaining ambient temperature and humidity conditions at
21 occupancy levels during the remainder of the construction period.

22 Rate equipment for continuous operation under the following conditions unless
23 otherwise indicated:

24 Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.

25 Altitude: Not exceeding 5600 feet.
26
27

28 COORDINATION
29

30 Coordinate layout and installation of panelboards and components with other construction that
31 penetrates walls or is supported by them, including electrical and other types of equipment,
32 raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces.
33 Maintain required workspace clearances and required clearances for equipment access doors
34 and panels.

35 Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.

36 Concrete, reinforcement, and formwork requirements are specified in Division 3.
37

38 PRODUCTS
39

40 MANUFACTURERS
41

42 Manufacturers: Subject to compliance with requirements, provide products by one of the
43 following:

44 Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

45
46 Eaton Corporation; Cutler-Hammer Products.

1 General Electric Co.; Electrical Distribution & Protection Div.
 2 Siemens Energy & Automation, Inc.
 3 Square D.

4
 5
 6 GENERAL REQUIREMENTS FOR PANELBOARDS
 7

8 Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.

9 Rated for environmental conditions at installed location.

10 Outdoor Locations: NEMA 250, Type 3R.

11 Kitchen Areas: NEMA 250, Type 4X, stainless steel.

12 Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

13 Front: Secured to box with concealed trim clamps. For surface-mounted fronts,
 14 match box dimensions; for flush-mounted fronts, overlap box.

15 Hinged Front Cover for Panelboards: Entire front trim hinged to box and with standard
 16 door within hinged trim cover.

17 Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with
 18 flanges for attachment to panelboard, wall, and ceiling or floor.

19 Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or
 20 primer coat.

21 Directory Card: With transparent protective cover, mounted in metal frame, inside
 22 panelboard door.

23
 24 Phase, Neutral and Ground Buses:

25 Material: Hard-drawn copper, 98 percent conductivity.

26 Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding
 27 conductors; bonded to box.

28 Neutral bus rated 100 percent of phase bus and UL listed as suitable for nonlinear loads.

29 Conductor Connectors: Suitable for use with conductor material and sizes.

30 Material: Hard-drawn copper, 98 percent conductivity.

31 Main and Neutral Lugs: Compression type.

32 Ground Lugs and Bus-Configured Terminators: Compression type.

33 Connectors shall be sized for feeder terminations as indicated on electrical single line
 34 diagram.

35 Feed-Through Lugs: Mechanical type, suitable for use with conductor material.

36 Locate at opposite end of bus from incoming lugs or main device.

37 Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on
 38 extra-capacity neutral bus.

39
 40 PANELBOARD SHORT-CIRCUIT RATING
 41

42 NRTL label indicating series-connected rating with integral or remote upstream overcurrent
 43 protective devices. Include size and type of upstream device allowable, branch devices
 44 allowable, and UL series-connected short-circuit rating.

45 Fully rated to interrupt symmetrical short-circuit current available at terminals.

1 DISTRIBUTION PANELBOARDS

- 2
- 3 Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- 4 For doors more than 36 inches high, provide two latches, keyed alike.
- 5 Main Overcurrent Protective Devices: Circuit breaker.
- 6 Branch Overcurrent Protective Devices:
- 7 For Circuit-Breaker Frame Sizes 125 A and Smaller: All circuit breakers shall be bolt-on
- 8 circuit breakers.
- 9

10 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- 11
- 12 Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- 13 Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without
- 14 disturbing adjacent units.
- 15 Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- 16

17 OVERCURRENT PROTECTIVE DEVICES

- 18
- 19 Molded-Case Circuit Breaker: UL 489, with series-connected rating or interrupting capacity to
- 20 meet available fault currents.
- 21 Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level
- 22 overloads, and instantaneous magnetic trip element for short circuits. Adjustable
- 23 magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- 24 GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault
- 25 protection (5-mA trip).
- 26 Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault
- 27 protection (30-mA trip).
- 28 GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
- 29 Molded-Case Circuit Breaker Features and Accessories: Standard frame sizes, trip
- 30 ratings, and number of poles.
- 31 Standard frame sizes, trip ratings, and number of poles.
- 32
- 33 Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor
- 34 materials
- 35 Application Listing: Appropriate for application; Type SWD for switching
- 36 fluorescent lighting loads; Type HACR for heating, air-conditioning, and
- 37 refrigerating equipment.
- 38 Multiple units enclosed in a single housing or factory assembled to operate as a
- 39 single unit.
- 40 Handle Clamp: Loose attachment, for holding circuit-breaker handle in on
- 41 position.
- 42 Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- 43 Fuses are specified in Section "Fuses."

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45

EXECUTION

EXAMINATION

Receive, inspect, handle, and store panelboards according to [NEMA PB 1.1].
Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
Proceed with installation only after unsatisfactory conditions have been corrected.

INSTALLATION

Install panelboards and accessories according to NEMA PB 1.1.
Mount top of trim 78 inches above finished floor, unless otherwise indicated.
Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
Install overcurrent protective devices and controllers not already factory installed.
Set field-adjustable, circuit-breaker trip ranges.
Install filler plates in unused spaces.
Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits [into raised floor space or] below slab not on grade.
Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
Comply with NECA 1.

IDENTIFICATION

Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section "Electrical Identification."
Create a directory to indicate installed circuit loads after balancing panelboard loads; Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section "Electrical Identification."

CONNECTIONS

Ground equipment according to Section "Grounding and Bonding."
Connect wiring according to Section "Conductors and Cables".

1
2 FIELD QUALITY CONTROL
3

4 Perform tests and inspections.

5 Acceptance Testing Preparation:

6 Test insulation resistance for each panelboard bus, component, connecting supply,
7 feeder, and control circuit.

8 Test continuity of each circuit.

9 Tests and Inspections:

10 Perform each visual and mechanical inspection and electrical test stated in NETA
11 Acceptance Testing Specification. Certify compliance with test parameters.

12 Correct malfunctioning units on-site, where possible, and retest to demonstrate
13 compliance; otherwise, replace with new units and retest.

14 Perform the following infrared scan tests and inspections and prepare reports:

15 Initial Infrared Scanning: After Substantial Completion, but not more than 60 days
16 after Final Acceptance, perform an infrared scan of each panelboard. Remove front
17 panels so joints and connections are accessible to portable scanner.

18 Follow-up Infrared Scanning: perform an additional follow-up infrared scan of each
19 panelboard 11 months after date of Substantial Completion.

20 Instruments and Equipment:

21 Use an infrared scanning device designed to measure temperature or to detect
22 significant deviations from normal values. Provide calibration record for
23 device.

24 Panelboards will be considered defective if they do not pass tests and inspections.

25 Prepare test and inspection reports, including a certified report that identifies panelboards
26 included and that describes scanning results. Include notation of deficiencies detected,
27 remedial action taken, and observations after remedial action.

28
29 ADJUSTING
30

31 Adjust moving parts and operable component to function smoothly, and lubricate as
32 recommended by manufacturer.

33 Set field-adjustable circuit-breaker trip ranges as specified in Section "Overcurrent Protective
34 Device Coordination."

35 Load Balancing: After Substantial Completion, but not more than 60 days after Final
36 Acceptance, measure load balancing and make circuit changes.

37 Measure as directed during period of normal system loading.
38
39

40 Perform load-balancing circuit changes outside normal occupancy/working schedule of
41 the facility and at time directed. Avoid disrupting critical 24-hour services such as fax
42 machines and on-line data processing, computing, transmitting, and receiving
43 equipment.

44 After circuit changes, recheck loads during normal load period. Record all load
45 readings before and after changes and submit test records.

46 Tolerance: Difference exceeding 20 percent between phase loads, within a

1 panelboard, is not acceptable. Rebalance and recheck as necessary to meet this
2 minimum requirement.

3

4 PROTECTION

5

6 Temporary Heating: Apply temporary heat to maintain temperature according to
7 manufacturer's written instructions.

8

9 CLEANING

10

11 On completion of installation, inspect interior and exterior of panelboards. Remove paint
12 splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in
13 cleaning. Repair exposed surfaces to match original finish.

14

15 END OF SECTION

1 SECTION 26 2726 - WIRING DEVICES

2
3 GENERAL

4
5 Related Documents

6 Drawings and general provisions of the Contract, including General and Supplementary
7 Conditions and Division 01 Specification Sections, apply to this Section.

8
9 Summary

10 Section Includes:

11 Receptacles, receptacles with integral GFCI, and associated device plates.
12 Snap switches.
13 Solid-state fan speed controls.
14 Communications outlets.
15 Cord and plug sets.

16 Related Sections include the following:

17 Section "Voice and Data Communication Cabling" for workstation outlets.

18
19 Definitions

20 EMI: Electromagnetic interference.

21 GFCI: Ground-fault circuit interrupter.

22 Pigtail: Short lead used to connect a device to a branch-circuit conductor.

23 TVSS: Transient voltage surge suppressor.

24 UTP: Unshielded twisted pair.

25
26 Submittals

27 Product Data: For each type of product.

28 Shop Drawings: List of legends and description of materials and process used for premarking
29 wall plates.

30
31 Quality Assurance

32 Source Limitations: Obtain each type of wiring device and associated wall plate through one
33 source from a single manufacturer. Insofar as they are available, obtain all wiring devices and
34 associated wall plates from a single manufacturer and one source.

35
36 Coordination

37 Receptacles for Owner-Furnished Equipment: Match plug configurations.

38
39 PRODUCTS

40
41 Manufacturers

42 Manufacturers' Names: Shortened versions (shown in parentheses) of the following
43 manufacturers' names are used in other Part 2 articles:

44 Receptacles, switches, dimmers and cord sets:

45 Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).

46 Hubbell Incorporated; Wiring Device-Kellems (Hubbell).

47 Leviton Mfg. Company Inc. (Leviton).

48 Pass & Seymour/Legrand (Pass & Seymour).

1 Occupancy sensors:
 2 Watt Stopper
 3 Novitas
 4 Lexiton

6 Straight-Blade Receptacles

7 Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration
 8 5-20R, and UL 498.
 9 Leviton Decora Series, Residential Grade
 10 Leviton Decora Series, Industrial Grade
 11 Leviton Straight Blade Series, Commercial Grade

13 GFCI Receptacles

14 General Description: Straight blade, feed through type. Comply with NEMA WD 1, NEMA WD
 15 6, UL 498, and UL 943, Class A and include indicator light that is lighted when device is tripped.
 16 Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 17 Products: Subject to compliance with requirements, provide one of the
 18 following:
 19
 20 Leviton Decora Series, Commercial Grade

22 Snap Switches

23 Comply with NEMA WD 1 and UL 20.
 24 Switches, 120/277 V, 20 A, Rocker type:
 25 Products: Subject to compliance with requirements, provide one of the
 26 following:
 27 Leviton Decora Series, Decora Series.
 28 Lexiton Decora Series, Commercial Series.

30 Wall Plates

31 Single and combination types shall match corresponding wiring devices.
 32 Plate-Securing Screws: Metal with head color to match plate finish.
 33 Material for Finished and unfinished spaces: Type 302 stainless steel.
 34 Material for Damp Locations: Cast aluminum with spring-loaded lift cover,
 35 and listed and labeled for use in wet and damp locations.

37 Finishes

38 Color: Wiring device catalog numbers in Section Text do not designate device color.
 39 Wiring Devices Connected to Normal Power System: As selected by
 40 Architect unless otherwise indicated or required by NFPA 70.
 41 Wiring Devices Connected to Emergency Power System: Red.

43 EXECUTION

45 Installation

46 Comply with NECA 1, including mounting heights listed in that standard, unless otherwise
 47 indicated.
 48 Coordination with Other Trades:

1 Take steps to insure that devices and their boxes are protected. Do not place wall finish
2 materials over device boxes and do not cut holes for boxes with routers that are guided by
3 riding against outside of boxes.

4 Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust,
5 paint, and other material that may contaminate the raceway system, conductors, and cables.

6 Install device boxes in brick or block walls so that the cover plate does not cross a joint unless
7 the joint is troweled flush with the face of the wall.

8 Install wiring devices after all wall preparation, including painting, is complete.

9 Conductors:

10 Do not strip insulation from conductors until right before they are spliced or terminated on
11 devices.

12 Strip insulation evenly around the conductor using tools designed for the purpose. Avoid
13 scoring or nicking of solid wire or cutting strands from stranded wire.

14 The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article
15 300, without pigtails.

16 Existing Conductors:

17 Cut back and pigtail, or replace all damaged conductors.

18 Straighten conductors that remain and remove corrosion and foreign matter.

19 Pig tailing existing conductors is permitted, provided the outlet box is large enough.

20 Device Installation:

21 Replace devices that have been in temporary use during construction and that were
22 installed before building finishing operations were complete.

23 Keep each wiring device in its package or otherwise protected until it is time to connect
24 conductors.

25 Do not remove surface protection, such as plastic film and smudge covers, until the last
26 possible moment.

27 Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
28 When there is a choice, use side wiring with binding-head screw terminals. Wrap solid
29 conductor tightly clockwise, two-thirds to three-fourths of the way around terminal
30 screw.

31 Use a torque screwdriver when a torque is recommended or required by manufacturer.

32 When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No.
33 12 AWG pigtails for device connections.

34 Tighten unused terminal screws on the device.

35 When mounting into metal boxes, remove the fiber or plastic washers used to hold
36 device-mounting screws in yokes, allowing metal-to-metal contact.

37 Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount
38 outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

39 Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension
40 vertical and with grounding terminal of receptacles on top. Group adjacent switches under
41 single, multigang wall plates.

42 Adjust locations of floor service outlets and service poles to suit arrangement of partitions and
43 furnishings.

44
45 Identification

46 Comply with Section 26 05 53 "Electrical Identification "

47 Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped,
48 or engraved machine printing with black -filled lettering on face of plate, and durable wire

1910

- 1 markers or tags inside outlet boxes.
- 2
- 3 END OF SECTION

1 SECTION 26 2813 - FUSES

2

3 GENERAL

4

5 Summary

6

7 This Section includes the following:

8 Cartridge fuses rated 600-V ac and less for use in safety / disconnect switches.
9 Spare-fuse cabinets.

10

11 Submittals

12 Product Data: For each type of product indicated. Include construction details, material,
13 dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include
14 the following for each fuse type indicated:

15 Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and
16 ratings.

17 Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak
18 let-through current) for each type and rating of fuse. [Submit on translucent log-log graph paper.]

19 Coordination charts and tables and related data.

20

21 Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance
22 manuals.

23

24 Include the following:

25 Let-through current curves for fuses with current-limiting characteristics.

26 Time-current curves, coordination charts and tables, and related data.

27 Ambient temperature adjustment information.

28

29 Quality Assurance

30 Source Limitations: Obtain fuses, for use within a specific product or circuit, from single
31 source from single manufacturer.

32 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by
33 a qualified testing agency, and marked for intended location and application.

34 Comply with NEMA FU 1 for cartridge fuses.

35 Comply with NFPA 70.

36

37 Project Conditions

38 Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100
39 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

40

41 Coordination

42 Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with
43 system short-circuit current levels.

44

45 Extra Materials

46 Furnish extra materials described below that match products installed and that are packaged with
47 protective covering for storage and identified with labels describing contents.

48

1 Fuses: Quantity equal to 10 percent of each fuse type and size, but no fewer than 3 of each type and
2 size.

3 4 PRODUCTS

5 6 Manufacturers

7 Manufacturers: Subject to compliance with requirements, provide products by one of the
8 following:

9 Cooper Bussmann, Inc.

10 Edison Fuse, Inc.

11 Littelfuse, Inc.

12 Mersen, Inc.

13 14 Cartridge Fuses

15
16 Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit
17 voltages.

18 19 Spare-Fuse Cabinet

20 Cabinet: Wall-mounted, 0.05-inch-thick steel unit with full-length, recessed piano-hinged door
21 and key-coded cam lock and pull.

22 Size: Adequate for storage of spare fuses specified with 5 percent spare capacity minimum.

23 Finish: Gray, baked enamel.

24 Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.

25 Fuse Pullers: For each size of fuse.

26 27 EXECUTION

28 29 Examination

30 Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

31 Examine holders to receive fuses for compliance with installation tolerances and other conditions
32 affecting performance, such as rejection features.

33 Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with
34 characteristics appropriate for each piece of equipment.

35 Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse
36 ratings.

37 Proceed with installation only after unsatisfactory conditions have been corrected.

38 Motor Branch Circuits: Class RK1 or Class RK5, time delay.

39 40 Installation

41 Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

42 Install spare-fuse cabinet(s).

43 44 Identification

45 Install labels indicating fuse replacement information on inside door of each fused switch and adjacent
46 to each fuse block, socket and holder.

47 48 END OF SECTION

1 SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

2
3 GENERAL

4
5 Summary

6 This Section includes the following individually mounted, enclosed switches and circuit breakers:

- 7 Fusible switches.
- 8 Nonfusible switches.
- 9 Molded-case circuit breakers.
- 10 Enclosures.

11
12 Definitions

- 13 GD: General duty.
- 14 GFCI: Ground-fault circuit interrupter.
- 15 HD: Heavy duty.
- 16 RMS: Root mean square.
- 17 SPDT: Single pole, double throw.

18
19 Performance Requirements

20 Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of
21 earthquake motions determined according to ASCE/SEI 7.

22 The term "withstand" means "the unit will remain in place without separation of any
23 parts from the device when subjected to the seismic forces specified."
24

25 Submittals

26 Product Data: For each type of enclosed switch, circuit breaker, accessory, and component
27 indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical
28 data on features, performance, electrical characteristics, ratings, accessories, and finishes.

29 Enclosure types and details for types other than NEMA 250, Type 1.

30 Current and voltage ratings.

31 Short-circuit current rating.

32 Features, characteristics, ratings, and factory settings of individual overcurrent
33 protective devices, accessories, and auxiliary components.

34 Operation and Maintenance Data: For enclosed switches and circuit breakers to include in
35 emergency, operation and maintenance manuals.

36 Manufacturer's written instructions for testing and adjusting enclosed switches and
37 circuit breakers.

38 Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections,
39 details, and attachments to other work.

40 Wiring Diagrams: For power, signal, and control wiring.
41

42 Quality Assurance

43 Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective
44 devices, components, and accessories, within same product category, from single source from
45 single manufacturer.

46 Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed
47 switches and circuit breakers, including clearances between enclosures, and adjacent surfaces

1 and other items. Comply with indicated maximum dimensions.

2 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by
3 a qualified testing agency, and marked for intended location and application.

4 Comply with NFPA 70.

5
6 Project Conditions

7 Environmental Limitations: Rate equipment for continuous operation under the following
8 conditions unless otherwise indicated:

9 Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.

10 Altitude: Not exceeding 5600 feet.

11
12 Coordination

13 Coordinate layout and installation of switches, circuit breakers, and components with
14 equipment served and adjacent surfaces. Maintain required workspace clearances and
15 required clearances for equipment access doors and panels.

16
17 Extra Materials

18 Furnish extra materials described below that match products installed and that are packaged
19 with protective covering for storage and identified with labels describing contents.

20 Spares: For the following:

21 Potential Transformer Fuses: 3.

22 Control-Power Fuses: 3.

23 Fuses for Fusible Switches: 3.

24 Fuses for Fused Power Circuit Devices: 3.

25 Spare Indicating Lights: Six of each type installed.

26
27 PRODUCTS

28
29 Fusible Switches

30 Eaton Electrical Inc.; Cutler-Hammer Products.

31 General Electric Company; GE Consumer & Industrial - Electrical Distribution.

32 Siemens Energy & Automation, Inc.

33 Square D/Group Schneider.

34 Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1,
35 horsepower rated, with cartridge fuse interiors to accommodate indicated fuses, lockable
36 handle with capability to accept two padlocks, and interlocked with cover in closed position.

37 Type HD, Heavy Duty, Single Throw, 240 -V ac, 1200 A and Smaller: UL 98 and NEMA KS 1,
38 horsepower rated, with clips or bolt pads to accommodate [specified] [indicated] fuses, lockable
39 handle with capability to accept three padlocks, and interlocked with cover in closed position.

40 Accessories:

41 Equipment Ground Kit: Internally mounted and labeled for copper and aluminum
42 ground conductors.

43 Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded;
44 labeled for copper and aluminum neutral conductors.

45 Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades
46 open.

47 Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are

1 specified.

2 Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate
3 before switch blades open.

4 Lugs: Mechanical type, suitable for number, size and conductor material.

5 Service-Rated Switches: Labeled for use as service equipment.

6 Service-Rated Switches: Labeled for use as service equipment.

7 Accessory Control Power Voltage: Remote mounted and powered; 120-Vac

8
9 Molded-Case Circuit Breakers And Switches

10 Eaton Electrical Inc.; Cutler-Hammer Business Unit.

11 General Electric Company; GE Consumer & Industrial - Electrical Distribution.

12 Siemens Energy & Automation, Inc.

13 Square D/Group Schneider.

14 General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting
15 capacity to comply with available fault currents.

16 Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and
17 instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for
18 circuit-breaker frame sizes 250 A and larger.

19 Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations
20 with Class A ground-fault protection (6-mA trip).

21 Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault
22 protection (30-mA trip).

23 Features and Accessories:

24 Standard frame sizes, trip ratings, and number of poles.

25 Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

26 Application Listing: Appropriate for application; Type SWD for switching fluorescent
27 lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting
28 circuits.

29 Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

30 Auxiliary Contacts: One SPDT with "a" and "b" contacts; "a" contacts mimic
31 circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

32 Alarm Switch: One NC contact that operates only when circuit breaker has tripped.

33 Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall
34 be removable only when circuit breaker is in off position.

35 Accessory Control Power Voltage: Integrally mounted, self-powered

36
37 Enclosures

38 Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to
39 comply with environmental conditions at installed location.

40 Indoor, Dry and Clean Locations: NEMA 250, Type 1.

41 Outdoor Locations: NEMA 250, Type 3R.

42 Kitchen Wash-Down Areas: NEMA 250, Type 4X, stainless steel.

43 Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

44 Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids:
45 NEMA 250, Type 12.

46 Hazardous Areas Indicated on Drawings: NEMA 250, Type 7 Type 9.

1 EXECUTION

2

3 Examination

4 Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance
5 with installation tolerances and other conditions affecting performance of the Work.

6 Proceed with installation only after unsatisfactory conditions have been corrected.

7

8 Installation

9 Install individual wall-mounted switches and circuit breakers with tops at uniform height unless
10 otherwise indicated.

11 Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and
12 temporary blocking of moving parts from enclosures and components.

13 Install fuses in fusible devices.

14 Comply with NECA 1.

15

16 Identification

17 Comply with requirements in Section 260553 "Identification for Electrical Systems."

18 Identify field-installed conductors, interconnecting wiring, and components; provide
19 warning signs.

20 Label each enclosure with engraved metal or laminated-plastic nameplate.

21

22 Adjusting

23 Adjust moving parts and operable components to function smoothly, and lubricate as
24 recommended by manufacturer.

25 Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent
26 Protective Device Coordination Study."

27

28 END OF SECTION

1 SECTION 26 43 13 - TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER
2 CIRCUITS

3
4 GENERAL

5
6 SUMMARY
7

8 This Section includes TVSSs for low-voltage power, control and communication equipment.
9

10 DEFINITIONS
11

12 ATS: Acceptance Testing Specifications.
13 SVR: Suppressed voltage rating.
14 TVSS: Transient voltage surge suppressor.
15

16 SUBMITTALS
17

18 Product Data: For each type of product indicated. Include rated capacities, operating weights,
19 electrical characteristics, furnished specialties, and accessories.

20 Field quality-control test reports, including the following:

21 Test procedures used.

22 Test results that comply with requirements.

23 Failed test results and corrective action taken to achieve requirements.

24 Operation and Maintenance Data: For transient voltage suppression devices to include in
25 emergency, operation and maintenance manuals.
26

27 QUALITY ASSURANCE
28

29 Source Limitations: Obtain suppression devices and accessories through one source from a
30 single manufacturer.

31 Comply with IEEE C62.41 "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and
32 test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to
33 Low-Voltage AC Power Circuits."

34 Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."

35 Comply with UL 1449, "Transient Voltage Surge Suppressors."
36

37 PROJECT CONDITIONS
38

39 Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless
40 permitted under the following conditions and then only after arranging to provide temporary
41 utility services according to requirements indicated:

42 Notify Architect no less than two days in advance of proposed utility interruptions.

43 Do not proceed with utility interruptions without Architect's written permission.

44 Service Conditions: Rate surge protection devices for continuous operation under the following
45 conditions, unless otherwise indicated:

46 Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system
47 operating voltage.

48 Operating Temperature: 30 to 120 deg F (0 to 50 deg C).

1 Humidity: 0 to 85 percent, non-condensing.
 2 Altitude: Less than 20,000 feet (6090 m) above sea level.

3
 4 COORDINATION

5
 6 Coordinate location of field-mounted surge suppressors to allow adequate clearances for
 7 maintenance.

8
 9 PRODUCTS

10
 11 MANUFACTURERS

12
 13 Manufacturers: Subject to compliance with requirements, provide products by one of the
 14 following:

15 Advanced Protection Technologies, Inc.
 16 Current Technology, Inc.
 17 Cutler-Hammer, Inc.; Eaton Corporation.
 18 General Electric Company.
 19 Innovative Technology, Inc.
 20 LEA International
 21 Liebert Corporation; a division of Emerson.
 22 Siemens Energy & Automation, Inc.
 23 Square D; Schneider Electric.
 24 Tycor; Cutler-Hammer, Inc.
 25 United Power Corporation.

26
 27 SERVICE ENTRANCE SUPPRESSORS

28
 29 Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following
 30 features and accessories:

31 LED indicator lights for power and protection status.
 32 Audible alarm, with silencing switch, to indicate when protection has failed.
 33 Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally
 34 closed, for remote monitoring of protection status. Contacts shall reverse on
 35 failure of any surge diversion module or on opening of any current-limiting
 36 device. Coordinate with building power monitoring and control system.
 37 Surge-event operations counter.

38 Peak Single-Impulse Surge Current Rating: 240 kA per phase.

39 Connection Means: Permanently wired.

40 Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE
 41 C62.41.2:

42 Line to Neutral: 70,000A
 43 Line to Ground: 70,000A
 44 Neutral to Ground: 50,000A

45 Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 208Y/120 3-phase,
 46 4-wire circuits shall be as follows:

47 Line to Neutral: 800 V for 480Y/277 V 400 V for 208Y/120 V.
 48 Line to Ground: 800 V for 480Y/277 V] [400 V for 208Y/120 V.

1 Neutral to Ground: 800 V for 480Y/277 V] [400 V for 208Y/120 V.
 2 Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall
 3 be as follows:

4 Line to Line: 2000 V for 480 V 1000 V for 240 V.
 5 Line to Ground: 2000 V for 480V 1000 V for 240 V

6 PANELBOARD SUPPRESSORS

7
 8 Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following
 9 features and accessories:

10 LED indicator lights for power and protection status.

11 Audible alarm, with silencing switch, to indicate when protection has failed.

12 One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of
 13 protection status.

14 Surge-event operations counter.

15 Peak Single-Impulse Surge Current Rating: 80 kA per phase.

16 Minimum single impulse current ratings, using 8-by-20-mic. sec waveform described in IEEE C
 17 62.41.2:

18 Line to Neutral: 70,000A.

19 Line to Ground: 70,000A.

20 Neutral to Ground: 50,000A.

21 Protection modes at UL 1449 SVR for grounded wye circuits with voltages of 480Y/277 208Y/120,
 22 3-phase, 4-wire circuits shall be as follows:

23 Line to Neutral: 800 V for 480Y/277 400 V for 208Y/120.

24 Line to Ground: 800 V for 480Y/277 400 V for 208Y/120.

25 Neutral to Ground: 800 V for 480Y/277 400 V for 208Y/120.

26 Protection modes and UL 1449 SVR for 240/120-V, 3-wire circuits shall be as follows:

27 Line to Neutral: 400 V.

28 Line to Ground: 400 V.

29 Neutral to Ground: 400 V.

30 Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as
 31 follows:

32 Line to Neutral: 400V, 800 V from high leg.

33 Line to Ground: 400 V.

34 Neutral to Ground: 400 V.

35 Protection modes and UL 1449 SVR for voltages of 480, 3-phase, 3-wire, delta circuits shall be as
 36 follows:

37 Line to Line: 2000 V for 480 V.

38 Line to Ground: 1500 V for 480 V.

39 SUPPRESSORS FOR ELECTRONIC-GRADE PANELBOARDS

40
 41 Surge Protection Device Description: Sine-wave-tracking type, panel-mounted design with the
 42 following features and accessories:

43 LED indicator lights for power and protection status.

44 Audible alarm, with silencing switch, to indicate when protection has failed.

45 One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of
 46 protection status.

47 Arrangement with wire connections to phase buses, neutral bus, and ground
 48 bus.

1 Peak Single-Impulse Surge Current Rating: 80 kA per phase.

2 Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 208Y/120, 3-phase,
3 4-wire circuits shall be as follows:

4 Line to Neutral: 400 V for 208Y/120.

5 Line to Ground: 400 V for 208Y/120.

6 Neutral to Ground: 400 V for 208Y/120.

7 Protection modes and UL 1449 SVR for 240/120-V, single-phase, 3-wire circuits shall be as follows:

8 Line to Neutral: 400 V.

9 Line to Ground: 400 V.

10 Neutral to Ground: 400 V.

11 Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as
12 follows:

13 Line to Neutral: 400 V, 800 V from high leg.

14 Line to Ground: 400 V.

15 Neutral to Ground: 400 V.

16 Protection modes and UL 1449 SVR for voltages of 480, 3-phase, 3-wire, delta circuits shall be as
17 follows:

18 Line to Line: 2000 V for 480 V.

19 Line to Ground: 1500 V for 480 V.

21 ENCLOSURES

22
23 NEMA 250, with type matching the enclosure of panel or device being protection.

24 EXECUTION

25 INSTALLATION OF SURGE PROTECTION DEVICES

26
27
28
29 Install devices at service entrance on load side, with ground lead bonded to service entrance
30 ground.

31 Install devices for panelboard and auxiliary panels with conductors or buses between suppressor
32 and points of attachment as short and straight as possible. Do not exceed manufacturer's
33 recommended lead length. Do not bond neutral and ground.

34 Provide multiple, 30-A circuit breaker as a dedicated disconnecting means for TVSS unless
35 otherwise indicated.

36 PLACING SYSTEM INTO SERVICE

37
38
39 Do not energize or connect service entrance equipment or panelboards to their sources until
40 surge protection devices are installed and connected.

41 FIELD QUALITY CONTROL

42
43
44 Testing: Perform the following field tests and inspections and prepare test reports:

45 After installing surge protection devices, but before electrical circuitry has been energized,
46 test for compliance with requirements.

47 Complete startup checks according to manufacturer's written instructions.

48 Perform each visual and mechanical inspection and electrical test stated in NETA

1910

1 Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS
2 installed. Disconnect before conducting insulation resistance tests, and reconnect immediately
3 after the testing is over.

4 DEMONSTRATION

5 Train Owner's maintenance personnel to maintain TVSS devices.

6 END OF SECTION