

project manual

MULTI-PURPOSE BUILDING
Rivermont Elementary School
3330 Hixson Pike
Chattanooga, Tennessee 37415
Bid File #: 24-22

July 3, 2023



HAMILTON
COUNTY
SCHOOLS

Hamilton County
Department of Education
Division of Auxiliary Services
2501 Dodds Avenue
Chattanooga, TN 37407

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FOR RIVERMONT ELEMENTARY SCHOOL**

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SECTION 00 00 10 - INVITATION TO BID

Name of Project: **MULTI-PURPOSE BUILDING FOR
RIVERMONT ELEMENTARY SCHOOL**
3330 Hixson Pike
Chattanooga, Tennessee 37415

Bid File #: **24-22**

Owner: **Hamilton County Department of Education**
3074 Hickory Valley Road
Chattanooga, Tennessee 37421
(423) 498-7030

SEPARATE sealed BIDS for **MULTI-PURPOSE BUILDING FOR
RIVERMONT ELEMENTARY SCHOOL**

will be received by Hamilton County Department of Education Procurement Department, Attn: Mr. Steven Hodgen, at 3074 Hickory Valley Road, Chattanooga, Tennessee 37421 until **2:00 pm, August 1, 2023**, and then at said place publicly opened and read aloud.

Sealed envelopes containing bids must be sent to the Purchasing Department and addressed to the Hamilton County Department of Education, 3074 Hickory Valley Road, Chattanooga, Tennessee 37421. Proposers must submit and mark an "original" bid and one "copy", plus one "USB Flash Drive" in one (1) sealed envelope. Include all required documents with each original and copy to be submitted. Bid documents may be secured from the Procurement Department at the above address and on our website at www.hcde.org via vendor registry [Subscription Selection | Vendor Registry](#). Bids received shall be opened by the Purchasing Department at the time and place designated in the Solicitation and/or associated addenda. The opening for the Bid shall be open to the public.

Bids must be received in the Purchasing Department prior to the designated time for opening. Bids received after the designated time of opening will be considered late, considered Non-Responsive and returned unopened to the bidder.

A Non-mandatory Pre-Bid Conference will be held on **July 19, 2023** at **10:00 AM** at the project site at Rivermont Elementary School.

The BIDDING DOCUMENTS may be examined at the following location(s):

Hamilton County Department of Education
Division of Auxiliary Services
2501 Dodds Avenue
Chattanooga, TN 37407

AGC of East Tennessee Planroom
[AGC of East Tennessee Online Planroom \(agcetnplanroom.com\)](http://agcetnplanroom.com)

Hamilton County Department of Education
Procurement Department
3074 Hickory Valley Road
Chattanooga, TN 37421
www.hcde.org via vendor registry
[Subscription Selection | Vendor Registry](#)

Digital copies of BIDDING DOCUMENTS may be obtained from the Hamilton County Department of Education, Division of Auxiliary Services, 2501 Dodds Avenue, Chattanooga, Tennessee, 37407 upon declaration of intent to bid. Request by Email: Floyd_d@hcde.org
Hard copies may be obtained for a \$500.00 non-refundable fee payable to the Hamilton County Department of Education.

BIDS shall be accompanied by a cashier's or bank check or BID guarantee bond in the amount not less than five percent (5%) of the BID made payable to Hamilton County Department of Education (Owner), and subject to the conditions provided in the INSTRUCTIONS FOR BIDDERS.

The successful bidder will be required to furnish acceptable Performance and Payment Bonds in the amount of one hundred percent (100%) of the contract price, each bond.

The Contractor shall comply with all State, Federal, and Local laws and/or regulations.

The Owner reserves the right to waive any irregularities or reject any or all bids.

Owner: Hamilton County Department of Education
3074 Hickory Valley Road
Chattanooga, Tennessee 37421

END OF SECTION

SECTION 00 10 00 - INSTRUCTIONS TO BIDDERS

**1.01 PROJECT: MULTI-PURPOSE BUILDING FOR
RIVERMONT ELEMENTARY SCHOOL**
3330 Hixson Pike
Chattanooga, Tennessee 37415

Bid File #: 24-22

1.02 ARCHITECT: Daniel L. Floyd
Hamilton County Department of Education
Division of Auxiliary Services
2501 Dodds Avenue
Chattanooga, TN 37407
(423) 498-7255
Email: floyd_d@hcde.org

1.03 BIDS:

- A. Bids to be considered must be made in accordance with the instructions contained herein.
- B. Bids shall be submitted on loose forms furnished by the Architect. The wording of the Bid Form shall not be changed or supplemented except in accordance with the instructions. All spaces shall be filled in with typewriter or ink. Where amounts are given both in words and figures, the words will govern in the event of conflict. Any erasures or corrections in the Bid Form must be initialed by the signer.
- C. Bids shall be accompanied by a 5% bid bond. The bid bond shall be executed on AIA A310 or acceptable form as published herein. All bidders must be able to qualify for 100% labor and materials/payment and performance bonds.
- D. All contractors bidding work under the contract which exceeds \$25,000.00 must be licensed in accordance with the State of Tennessee Contractor's Licensing Act of 1994. Any HVAC, plumbing, and/or electrical sub-contractors whose work is equal to or exceeds \$25,000.00 must also be licensed in the State of Tennessee in accordance with Contractor's Licensing Act of 1994.

1.04 DOCUMENTS

- A. Documents for bidding purposes will be available for examination and will be obtainable at the Auxiliary Services office of Hamilton County Department of Education during regular business hours. Contact Daniel Floyd Floyd_d@hcde.org 423-498-7255.
- B. Prospective bidders only may obtain complete sets of digital or printed documents for bidding purposes upon request. No partial sets will be issued.

1.05 EXAMINATION OF SITE AND DOCUMENTS

Upon submitting a bid, it is presumed that the bidder has visited the site of the work, has acquainted himself with the conditions as they exist, has thoroughly examined the Drawings and Specifications prepared by the Architect, including other parts of the proposed Contract Documents and fully understands the conditions, difficulties and restrictions attending the execution of the work. It is understood that omissions from the bid due to the failure of the bidder to fully acquaint himself with the site conditions and the requirements if the Documents will not entitle the bidder to additional consideration or compensation if awarded the contract.

1.06 INTERPRETATION OF DOCUMENTS

- A. Interpretations of the meaning of the Bid Requirements, or of the proposed Contract Documents will be valid only if issued in writing by the Architect as an Addendum. Such addenda will be issued no later than two days prior to the date for receiving bids. Each Addendum will be numbered and dated and issued to prospective prime bidders of record at the time of issuance through email, Vendor Registry and AGC Planroom. It is the responsibility of the prime bidder to inquire about addenda issuance and to coordinate addenda information with sub-contractors. The Architect will not submit addenda to sub-contractors. The interpretations of clarifications made other than by such addenda will not be binding upon the Owner or the Architect. Each bidder submitting a bid must acknowledge receipt of Addenda received in the blanks provided for this purpose in the Bid Form.
- B. Should a bidder find discrepancies in, or omissions from the Documents, or should he be in doubt as to the meaning of any requirements on the Documents, he shall at once notify the Architect in writing, but in no event later than five days prior to the date for receiving bids. Conflicting requirements brought to the Architect's attention subsequent to five days prior to the date for receiving bids will be subject to the Architect's decision and at no additional cost to the Owner.

1.07 PRE-BID CONFERENCE

- A. A Non-mandatory Pre-Bid Conference will be held on this project on **July 19, 2023 at 10:00** AM at the project site.

1.08 SUBMISSION OF BIDS

- A. Bids will be received by the Hamilton County Department of Education Purchasing Department at 3074 Hickory Valley Road, Chattanooga, Tennessee, 37421 until **2:00 p.m. local time on August 1, 2023**, at which time all bids will be opened and publicly read aloud. Bids shall be marked to the attention of Steven Hodgen, Purchasing Supervisor (423-498-7030).

- B. Bids received within the time fixed for receiving bids will be opened and publicly read aloud, irrespective of any irregularities therein. Bids received after the time set for receiving bids will not be considered. Bidder must submit two (2) copies of bid; one (1) marked "original" and one (1) marked "copy" in one (1) sealed envelope.
- C. Bids shall be submitted at the time and place indicated in the Request for Bids and be in compliance with the T.C.A. 62-6-102 through 62-6-119. Bidders must have a State Contractors License at the time of the Bid opening and produce a copy of same. Bids shall be submitted in a sealed envelope clearly marked as follows:
- Project Title
 - Bid File #
 - Bidder's Name and Address
 - Bidder's Tennessee Contractor's License Number
 - Bidder's License Expiration Date
 - Bidder's License Category of Classification.

The Masonry, HVAC, Plumbing and Electrical subcontractor's names shall be listed on the outside of the bid envelope. If their work is equal to or exceeds \$25,000, their license number, classification and expiration date shall also appear on the outside on the envelope according to T.C.A. 62-6-119.

All envelopes containing bids that are not marked as described above will be declared non-responsive, will not be opened, and will be returned to the Bidder unopened.

If forwarded by mail, the sealed envelopes containing the Bid must be enclosed in another envelope addressed as specified on the Bid Form.

Bids must be accompanied by the Bid Security.

1.09 AWARD OF THE CONTRACT

- A. Rights of Owner- The Hamilton County Department of Education reserves the right to reject any or all bids or any part thereof, to waive technicalities and informalities, and to award a contract to other than the low bidder.
- B. The form of agreement will be AIA A-101, "Standard Form of Agreement Between Owner and the Contractor where basis of payment is a Stipulated Sum", 2017 Edition.
- C. The Owner reserves the right to reject the bid of any bidder who has previously failed to perform properly, or to complete on time, contracts of a similar nature; who is not in a position to perform the contract, or who has habitually and without just cause, neglected the payment of bills or otherwise disregarded his obligations to subcontractors, material suppliers, or employees. The ability of a

bidder to obtain a performance bond shall not be regarded as the sole test of such bidder's competency or responsibility.

1.10 BIDDING TERMS AND CONDITIONS

These terms and conditions shall be part of the Contract. HCS reserves the right to negotiate other terms and conditions it deems appropriate and necessary under the circumstances to protect the public's trust.

Note: Throughout this document the terms Proposer, Contractor, Company, Vendor, Firm or Bidder are used interchangeably and refer to any organization submitting a response to any solicitation. Additionally, the words terms, quote, bid, proposal are used interchangeably and refer to the submission in response to any solicitation. Hamilton County Schools, will be referenced as "HCS".

- A. **Quality and Guarantee** - All material on which bids are submitted shall be of the quality and grade specified.
- B. **Requirements for Submitting Bids** – Bids made on forms other than the Bid Form will not be considered. No modifications or alterations to the bid documents may be made either by interlineation, supplements or deletions. Documents submitted with modifications of any kind will be ruled non-responsive and the vendor possibly removed or suspended from the bid vendor listing for a period of up to two (2) years. The signature of the person submitting the bid shall be in longhand without erasure.
- C. **Bid amendment:** If it becomes evident that an invitation must be amended, a formal written Addendum will be issued to all known Bidders. If necessary, a new due date will be established.
- D. **Bid delivery:** HCS requires that all bids be submitted and time/date-stamped by the date and before the time specified in the bid documents to be considered, regardless of method of delivery. The time clock in the Procurement Department shall be the official record of the time. HCS is not responsible for any technical difficulties of any vendor in the delivery of its bid. No late bids will be accepted, opened or returned.
- E. **Bid forms:** Bidders must complete bid forms contained in the bid package. Failure to fully complete the bid forms may result in rejection of the bid.
 - 1. All information shall be entered in ink or typed/computer generated. Mistakes may be crossed out and corrections inserted before submission of your bid. Corrections shall be initialed in ink by the person signing the bid. Corrections and/or modifications received after the closing time specified will not be accepted.
- F. **Bid preparation:** Prospective bidders are solely responsible for their own expenses in Bid preparation and subsequent negotiations with HCS, if any.

- G. **Bid pricing**: Any bid, and its associated pricing, shall remain valid for at least ninety (90) days after the bid due date, unless otherwise indicated in the bid specifications. Unit price must be shown for products or services as requested. In case of error in extension, unit price will govern.
- H. **Bid submission and transmission**: Bid must be submitted in a sealed envelope with the Bid Number/Name, the closing date and time, as well as your company name provided on the envelope. If your response envelope is enclosed in another envelope/package for delivery, the latter should also be clearly labeled with the same identifying information.
1. All bids are to be F.O.B. Hamilton County, TN. All responses to this invitation become the property of HCS. Bid(s) submitted via e-mail or facsimile machine are unacceptable.
- I. **Cooperation with Other Service Providers**: If HCS undertakes or awards other contracts for additional related work, the Contractor shall fully cooperate with such other Service Providers and HCS employees, and carefully fit its own work to such additional work as may be directed by HCS. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other Service Provider or County employees.
- J. **Withdrawal** - Withdrawal of an inadvertent or erroneous bid or proposal by the Contractor (before or after opening) may be permitted, when the Purchasing Department determines it to be appropriate. For an unopened manually submitted bid or proposal in exclusive possession of HCS to be withdrawn, a written request for withdrawal must be submitted to the office of the HCS Purchasing Department by a duly authorized representative of the Contractor. To take effect, such requests must be received prior to the time set for the opening. A successfully withdrawn submission may be replaced with another sealed bid / proposal if it is received prior to the time set for the opening. In all cases, determination of bid / proposal receipt will be solely governed by the clock-in time as determined by a clock or timepiece designated by the Purchasing Department. No other clock or timepiece will have any bearing on determining whether or not the bid / proposal has been received prior to the time set for the opening. Electronic bids / proposals are available to be withdrawn by the Contractor until the specified opening. An apparent successful bidder alleging a material mistake may be allowed to withdraw their Bid at the option of HCS.
- K. **Rights of Owner** - The Hamilton County Board of Education reserves the right to reject any or all bids or any part thereof, to waive technicalities and informalities, and to award a contract to other than the low bidder.
- L. **Negotiation** – Hamilton County Department of Education may select a successful Contractor on the basis of initial offers received without discussions. Therefore, each Bid shall contain the Contractor's best terms from a cost or price, experience and technical and service standpoint. Hamilton County Department of Education reserves the right to enter into negotiations with Contractors. If Hamilton County Department of Education and the selected Contractor cannot

negotiate a successful agreement, Hamilton County Department of Education may terminate said negotiations and begin negotiations with the other Contractors. Hamilton County Department of Education retains the right to negotiate with multiple Contractors simultaneously. This process will continue until a Contract has been executed or all Contractors have been rejected. No Contractor shall have any rights against Hamilton County Department of Education arising from such negotiations.

- M. **Clarification of Bid Document** - Should a bidder find discrepancies in or omissions from the bid document or should he be in doubt as to its meaning, he shall at once request clarification of the Owner.
- N. **Awarding of Contracts** - Award will be made to the most responsive, responsible bidder(s) meeting specifications, who presents the product of service that is in the best interest of HCS. HCS reserves the right: (1) to award bids received on the basis of individual items, or groups of items, or on the entire list of items; (2) to reject any or all bids, or any part thereof; (3) to waive any informality in the bids; and (4) to accept the bid that is considered lowest and best.
- O. **Meeting Specifications** - By my written signature on this bid, I (we) agree and certify that all items included in the bid meet or exceed any and all specifications covering such items. I (we) further agree, if awarded a contract, to deliver merchandise which meets or exceeds the specifications. Failure to comply with this section will result in the removal of your firm from our list of bidders for at least six (6) months. This penalty does not preclude action to enforce specific performance.
- P. **Declaration/Statement by Bidder** - The respondent hereby states that he, his company, or any of its employees, agents, officers or proposed sub-contractors have not violated or participated in a violation of, been convicted, or pled "nolo contendere" to any act involving an unlawful restraint of trade such as, but not limited to violations of the Sherman Act (15 U.S.C. § 1-2), the Racketeer Influenced and Corrupt Organizations Act (18 U.S.C. 1961-1968), the Hobbs Act (18 U.S.C. §1961), the mail or wire fraud statutes (18 U.S.C. §1341,1343), the false statements statute (18 U.S.C. §1001), the Tennessee Anti-Trust Act (T.C.A. § 47-25-101) or similar state or federal law. Respondent further states that he, his company or any of its officers, agents, or employees have not been debarred by any governmental agency (Federal, state, or local).
1. In submitting this bid, you are certifying that you are aware of the requirements imposed by T.C.A. §49-5-413(d) to conduct criminal background checks through the Tennessee Bureau of Investigation and the Federal Bureau of Investigation on yourself and any of your employees who may come in direct contact with students or who may come on or about school property anytime students are present. You are further certifying that at no time will you ever permit any individual who has committed a sexual offense or who is a registered sex offender to come in direct contact with children or to come on or about school property while students are present.
- Q. **Drug-Free Workplace Program**- Note: Required for construction services,

encouraged for others. Law prohibits state or local governments from contracting for construction services with any private entity having five or more employees who has not furnished a written affidavit by its principal officer at the time of the bid or contract stating that the contractor is in compliance with the provisions of this act. Other organizations are encouraged to ensure that their workplace is Drug-Free

- R. **Title VI of the Civil Rights Act of 1964** - No person shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.
- S. **Title IX of the Education Amendments of 1972** - Prohibits discrimination based on gender in all programs or activities that receive Federal financial assistance. Title IX also includes same gender harassment as well as student-to-student harassment.
- T. **Bid Acceptance**- Bidders shall hold their price and/or discount firm and subject to acceptance by HCS for a period of forty five (45) days from the date of the bid opening, unless otherwise indicated in their bid.
- U. **Qualifications of Bidders**- A bidder may be required, before the award, to show to the complete satisfaction of HCS that it has the necessary facilities, ability, insurance, and financial resources to provide the service or goods specified.
- V. **Restrictive or Ambiguous Contract Documents**- It is the responsibility of the prospective bidder to review the entire invitation to bid (ITB) or Invitation to Bid (Bid) packet and to notify the Procurement Department if the Contract Documents are formulated in a manner that would unnecessarily restrict competition. Any such protest or question regarding the Contract Documents of bidding procedures must be received in the Procurement Department *not less than seventy-two hours* prior to the time set for bid opening. These requirements also apply to Contract Documents that are perceived to be ambiguous.
- W. **Samples**: Samples of articles, when required, shall be furnished free of cost of any sort to HCS and may be retained for future comparison. Samples which are not destroyed by testing or which are not retained for future comparison will be returned upon request *at bidder expense*.
- X. **TN Department Of Revenue Requirements**: Before the Contract resulting from this solicitation is signed, the apparent successful Proposer must be registered with the Department of Revenue for the collection of Tennessee sales and use tax. HCS shall not approve a contract unless the Proposer provides proof of such registration. The foregoing is a mandatory requirement of an award of a contract pursuant to this solicitation.
- Y. **No Contact Policy**- After the date and time established for receipt of bids by the HCS Procurement Department, any contact initiated by any bidder with any HCS representative, other than the Procurement Division representative listed herein, concerning this solicitation is prohibited. Any such unauthorized contact may

cause the disqualification of the bidder from this procurement transaction.

- Z. **Acceptance:** all terms and conditions in this contract are deemed to be accepted by the vendor and incorporated in the bid, except the provision(s) which are expressly excluded by the specifications.
- AA. **Additional Information:** vendors are cautioned that any statement made by any individual or employee of HCS that materially changes any portion of the bid document, either before or after the issuance of the bid documents, shall not be relied upon unless subsequently ratified by a formal written Addendum to the bid document.
- BB. **Alteration or amendments:** no alterations, amendment, changes, modifications or additions to any contract resulting from this bid shall be binding on HCS without the prior written approval of HCS.
- CC. **Assignment:** contractors shall not assign or sub-contract this agreement, its obligations or rights hereunder to any party, company, partnership, incorporation or person without the prior written consent of HCS.
- DD. **Brand names:** brand names and numbers, when used, are for reference to indicate the character or quality desired. Equal items will be considered, provided they are clearly identified by manufacturer, part number, diagrams, brochures and other related material, *unless stated otherwise in the bid specifications*. When brand, number, or level of quality is not stated by the bidder, it is understood the offer is exactly as specified.
- EE. **Code Of Ethics:** all suppliers are expected to adhere to business ethics and professional behaviors as outlined in these documents.
- FF. **Compliance With All Laws:** companies submitting bids must agree to observe and comply with all federal, state, and local laws, statutes, ordinances, and regulations, including but not limited to title vi of the federal civil rights act of 1964, the equal employment opportunity act and the regulations issued there under by the federal government, the Americans with disabilities act of 1990 and the regulations issued there under by the federal government, in any manner affecting the provision of goods and/or services, and all instructions, prohibitive orders issued, and shall obtain all necessary permits.
- GG. **Declarative Statement:** any statement or word (e.g., must, shall, will) are declarative statements and the vendor must comply with the conditions. Failure to comply with any such statement may result in their bid being deemed non-responsive and disqualified.
- HH. **Default:** in case of default by the vendor, HCS may procure the articles or services from other sources and may deduct from any monies due, or that may thereafter become due to the vendor, the difference between the price named in the contract or purchase order and actual cost thereof to HCS. Prices paid by HCS shall be considered the prevailing market price at the time such purchase is made. Periods of performance may be extended if the facts as to the cause of the

delay justify such extension in the opinion of the procurement director.

- II. **Delivery Of Goods And Services** - it is understood and agreed that this bid shall constitute an offer which, when approved by the school board and accepted in writing by the purchasing department, will constitute a valid and binding contract between the undersigned and the Hamilton County Department of Education. Failure to supply needed material and/or services will result in removal of your firm from our list of bidders for at least six (6) months.
- JJ. **Completion Requirements**: time of Completion shall be stated as the number of calendar days or final Completion Date as stipulated in the contract. *Note: time of completion may be a consideration in the award.*
- KK. **Drug-Free Workplace Program for Construction Services**: law prohibits state or local governments from contracting for construction services with any private entity having five or more employees who has not furnished a written affidavit by its principal officer at the time of the bid or contract stating that the contractor is in compliance with the provisions of this act. Companies, other than construction services, are also encouraged to have and maintain drug-free workplace policies.
- LL. **Grant Funded Purchases**: for purchases that are grant funded, the grant agreement may contain/require special terms and conditions. If there is a conflict between the terms and conditions of the grant agreement and the general terms and conditions of the bid or bid, the grant agreement terms and conditions shall prevail.
- MM. **Indemnifications/Hold Harmless**: contractor shall indemnify, defend, save and hold harmless HCDE, the school board, administration, and their agents and employees from any and all suits, claims, actions or damages of any nature brought because of, arising out of, or related to the contractor's performance under the terms of this contract, including the work of any sub-contractor, and without regard to any allegations of fault.
- NN. **Insurance Requirements**: The Contractor shall maintain the following minimum insurance requirements throughout the duration of the Agreement. HCS reserves the right to request additional documentation or additional policies be provided at its sole discretion and where deemed in its best interest. HCS in no way represents that the insurance required is sufficient or adequate to protect the Contractor's interest or liabilities.

Contractor shall provide Worker's Compensation Insurance as required by applicable laws of the State of Tennessee and shall provide liability insurances as required. All insurance must be occurrence based. Contractor shall add Hamilton County Department of Education as additional named insured by policy endorsement and provide a certificate of insurance evidencing such coverage and endorsement number (#) for each additional named insured. Complete copies of insurance policies must be provided, if requested. A failure to provide said documentation will be considered a contract breach and grounds for termination of contract or pending award recommendation.

| |
|---------------------------|
| Insurance Required |
|---------------------------|

| Coverage | Amount |
|------------------------------|---|
| Workers Compensation | Statutory Limits of Tennessee |
| Employers Liability | \$1,000,000 per occurrence |
| Commercial General Liability | \$1,000,000 each occurrence; \$2,000,000 aggregate |
| Auto (Truck) Liability | \$1,000,000 each occurrence |

OO. **Invoices**: will be returned for correction unless they contain the following information: purchase order number; item numbers; description of item; quantity; unit price; extensions; and total.

PP. **New equipment**: the Contractor shall guarantee that the units submitted for this bid shall be new, and the latest and most improved model of current production, and shall be first quality as to workmanship and materials used in said units. All modifications shall be made at the factory. Demonstrators shall not be acceptable. *Note: when the bid is for services, this item does not apply.*

QQ. **Non-Collusion**: Contractors, by submitting a signed bid, certify that the accompanying bid is not the result of, or affected by, any unlawful act of collusion with any other person or company engaged in the same line of business or commerce, or any other fraudulent act punishable under Tennessee or federal law.

RR. **Non-Conflict Statement**: Contractors, by submitting a signed bid, agree that it has no public or private interest and shall not acquire directly or indirectly any interest that would conflict in any manner with the provision of its goods or performance of its services. Contractor warrants that no part of the total contract amount provided herein shall be paid directly or indirectly to any officer or employee of HCS as wages, compensation, or gifts in exchange for acting as officer, agent, employee, subcontractor or consultant to the contractor in connections with any goods provided or work contemplated or performed relative to the agreement.

SS. **Non-Discrimination Statement**: Contractor must agree that no person on the grounds of age, color, disability, gender, genetic information, national origin, political affiliation, race, religion, sexual orientation, or veteran's status shall be excluded from participation in, or be denied benefits of, or be otherwise subjected to discrimination in the performance of this agreement, or in the employment practices of Contractor. Contractor shall upon request show proof of such non-discrimination, and shall post in conspicuous places available to all employees and applicants notices of non-discrimination. Contractor covenants that it complies with the fair wage and hour laws, the national labor relations act, and other federal and state employment laws as applicable. Contractor covenants that it does not engage in any illegal employment practices.

TT. **Payment Method**- HCS utilizes Purchase Orders for placing orders for General Contracting. These Purchase Orders will be issued from HCS Procurement Division. The Purchase Order will detail the quantity, specific items(s) and the

contracted price for each item.

UU. **Payment Terms:** HCS payment terms are Net 30 after receipt of approved Pay Application unless otherwise stated in the contract documents.

VV. **Public Access to Procurement Information:** Subject to the requirements of the TN Open Records Act, information relating to the award of a particular contract shall be open to the public only after evaluation of that bid or bid has been completed. All public records pertaining to procurement shall be open for inspection during normal business hours as scheduled in advance with the Procurement Department.

WW. **Protest of Award:** Any Contractor who has submitted a timely bid or bid in response to a solicitation may protest the recommendation of award for a contract by submitting such protest to HCS's Director of Procurement. Any protest must be submitted in writing and be in the possession of the Procurement Department before noon (ET) of the 2nd working day following the public recommendation of contract award.

FAILURE OF A CONTRACTOR TO FOLLOW THE PROTEST REQUIREMENTS WITHIN THE TIME FRAMES PRESCRIBED IN THIS SECTION CONSTITUTES A WAIVER OF THE PROTEST AND ANY RESULTING CLAIMS.

XX. **Right to Audit:** During all phases of the work and services to be provided hereunder the Contractor agrees to permit duly authorized agents and employees of HCS to enter the Contractor's offices for the purpose of inspections, reviews and audits during normal working hours. Reviews may also be accomplished at meetings that are arranged at mutually agreeable times and places. The Contractor will maintain all books, documents, papers, accounting records, and other evidence pertaining to the fee paid/charged under this Contract and make such materials available at their offices at all reasonable times during the period of this Contract and for seven (7) years from the date of payment under this Contract for inspection by HCS or by any other governmental entity or agency participating in the funding of this Contract, or any authorized agents thereof; copies of said records to be furnished if requested.

YY. **Severability:** If any provisions of these Rules or any application thereof to any person or under any circumstance is held to be invalid, such invalidity shall not affect the provisions or applications of these rules which can be given effect without the invalid provision or application, and to this end the provisions of these Rules are declared to be severable.

ZZ. **Termination for Cause:** In the event of any breach of contract by the successful Contractor(s), HCS may serve written notice to the Contractor of its default, setting forth with specificity the nature of the default. If the defaulting party fails to cure its default within thirty (30) days after receipt of the notice of default, then HCS shall have the right to terminate the contract upon thirty (30) days written notice and pursue all other remedies available to HCS, either at law or in equity.

AAA. **Termination for Convenience:** Contract may be terminated for convenience

by either party by giving written notice to the other, at least sixty (60) days before the effective date of termination unless otherwise specified in the solicitation and/or contract documents. Said termination shall not be deemed a Breach of Contract.

BBB. Termination Due To Non-Appropriation: HCS shall not be obligated for the Contractor's performance hereunder or by any provision of this Contract during any of HCS's future fiscal years unless and until HCS appropriates funds for this Contract in HCS's Budget for each such future fiscal year.

CCC. Bidding Terms and Conditions: In the event of a conflict between the General Conditions specifications and these Bidding terms and conditions, the General Conditions or specifications or will govern.

DDD. Warranties: Contractor warrants to HCS that all items delivered and all services rendered shall conform to the specifications, drawings, bid and/or other descriptions furnished and/or incorporated by reference, and will be fit for the particular purpose purchased, of merchantable quality, good workmanship, and free from defects. Contractor extends to HCS all warranties allowed under the U.C.C. Contractor shall provide copies of warranties to the HCS. Return of merchandise not meeting warranties shall be at Contractor expense.

EEE. Waiving of Informalities: HCS reserves the right to waive minor informalities or technicalities when it is in the best interest of HCS.

FFF. Governing Law/Jurisdiction: The Agreement shall be governed by the laws of the State of Tennessee. Any action brought in law or in equity to enforce any provision of the entire Agreement shall be filed in the appropriate state court in Hamilton County, Tennessee. In any action to enforce this Agreement, the prevailing party shall be entitled to recover its costs and expenses, including reasonable attorney's fees. By submission of a proposal and acceptance of a Purchase Order or Contract, Contractor hereby agrees to adhere to Governing Law/Jurisdiction requirements as described herein.

HCS DOES NOT DISCRIMINATE ON THE BASIS OF AGE, COLOR, DISABILITY, GENDER, GENETIC INFORMATION, NATIONAL ORIGIN, POLITICAL AFFILIATION, RACE, RELIGION, SEXUAL ORIENTATION, OR VETERAN'S STATUS IN THE EVALUATION AND AWARD OF BIDS

1.11 PRECONSTRUCTION CONFERENCE

- A. Prior to the start of construction, the Contractor shall attend a Pre-Construction Conference with representatives of the Owner and the Architect. The conference will serve to acquaint the participants with the general plan of contract administration and requirements under which the construction is to proceed.

- B. The date, time and place of the conference will be furnished to the Contractor by the Architect.

1.12 FUNDING NOTICE AND DAVIS BACON NOTICE:

- A. As a notice to all Bidders, this solicitation and its associated Agreement is funded in whole or in part with Federal funds in addition to general funds of the agency. Federal provisions as provided within the Federal Notice & Provisions of this Agreement shall apply.
- B. Davis-Bacon regulations have been waived for this project.

1.13 FUNDING PROVISIONS:

1. EQUAL EMPLOYMENT OPPORTUNITY:

1.1. During the performance of this contract, the contractor agrees as follows:

- A. The Consultant/Contractor/Vendor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Consultant/Contractor/Vendor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Consultant/Contractor/Vendor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- B. The Consultant/Contractor/Vendor will, in all solicitations or advertisements for employees placed by or on behalf of the Consultant/Contractor/Vendor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
- C. The Consultant/Contractor/Vendor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the Consultant/Contractor/Vendor's legal duty to furnish information.
- D. The Consultant/Contractor/Vendor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers'

representative of the Consultant/Contractor/Vendor's commitments under section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

- E. The Consultant/Contractor/Vendor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- F. The Consultant/Contractor/Vendor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- G. In the event of the Consultant/Contractor/Vendor's non-compliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the Consultant/Contractor/Vendor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- H. The Consultant/Contractor/Vendor will include the provisions of paragraphs (a) through (h) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each sub-Consultant/Contractor/Vendor. The Consultant/Contractor/Vendor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the Consultant/Contractor/Vendor becomes involved in, or is threatened with, litigation with a sub-Consultant/Contractor/Vendor as a result of such direction, the Consultant/Contractor/Vendor may request the United States to enter into such litigation to protect the interests of the United States.

2. MAINTENANCE OF RECORDS:

- 2.1. The Consultant/Contractor/Vendor will keep and maintain adequate records and supporting documentation applicable to all of the services, work, information, expense, costs, invoices and materials provided and performed pursuant to the requirements of this agreement. Said records and documentation will be retained by the Consultant/Contractor/Vendor for a minimum of seven (7) years from the date of termination of this agreement, or for such period is required by law.
- 2.2. Consultant/Contractor/Vendor shall provide, when requested, access by HCS, Federal granting agency, the Comptroller General of the United States, or any of their duly authorized representatives to any books, documents, papers, and records of the Consultant/Contractor/Vendor which are directly pertinent to this contract for the purpose of making audit, examination, excerpts, and transcriptions.
- 2.3. Consultant/Contractor/Vendor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.
- 2.4. Consultant/Contractor/Vendor agrees to provide the Grant Agency Administrator or his authorized representatives' access to construction or other work sites pertaining to the work being completed under the contract.
- 2.5. Consultant/Contractor/Vendor shall retain all records associated with this Agreement for a period

of no less than five (5) years after final payments and all other pending matters are closed.

2.6. HCS and its authorized agents shall, with reasonable prior notice, have the right to audit, inspect and copy all such records and documentation as often as HCS deems necessary during the period of this agreement, and during the period as set forth in the paragraphs above; provided, however, such activities shall be conducted only during normal business hours of the Consultant/Contractor/Vendor and at the expense of HCS.

3. DHS SEAL, LOGO, AND FLAGS

3.1. The Consultant/Contractor/Vendor shall not use the DHS seal(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials without specific Grant Agency pre-approval.

4. LOCAL VENDOR PREFERENCE EXCLUSION

4.1. Local Vendor Preference is not applicable to this Agreement and subsequent contract and/or purchase order(s).

5. COMPLIANCE WITH FEDERAL LAW, REGULATIONS, and EXECUTIVE ORDERS

5.1. This is an acknowledgment that Grant Agency financial assistance will be used only to fund the services requested. The Consultant/Contractor/Vendor will comply with all applicable federal law, regulations, executive orders, Grant Agency policies, procedures, and directives.

6. NO OBLIGATION BY THE FEDERAL GOVERNMENT

6.1. The Federal Government is not a party to this Agreement and is not subject to any obligations or liabilities to the non-Federal entity, Consultant/Contractor/Vendor, or any other party pertaining to any matter resulting from the Agreement.

7. FRAUD and FALSE OR FRAUDULENT OR RELATED ACTS

7.1. The Consultant/Contractor/Vendor acknowledges that 31 U.S.C. Chapter 38 (Administrative Remedies for False Claims and Statements) applies to the Consultant/Contractor/Vendors actions pertaining to this Agreement.

8. SUBCONTRACTS

8.1. The selected firm must require compliance with all federal requirements of all sub-Consultant/Contractor/Vendors performing work for Prime Consultant/Contractor/Vendor under this Agreement, by including these federal requirements in all contracts with sub-Consultant/Contractor/Vendors.

9. CONFLICT OF INTEREST:

9.1. No employee, officer, or agent may participate in the selection, award, or administration of a contract supported by a Federal award if he or she has a real or apparent conflict of interest. Such a conflict of interest would arise when the employee, officers, or agent, any member of his or her immediate family, his or her partner, or an organization which employs or is about to employ any of the parties indicated herein, has a financial or other interest in or a tangible personal benefit from a firm considered for a contract. The officers, employees, and agents of the non-Federal entity must neither solicit nor accept gratuities, favors, or anything of monetary value from Consultant/Contractor/Vendors or parties to subcontracts.

10. EMPLOYMENT ELIGIBILITY VERIFICATION SYSTEM (E-VERIFY):

10.1. Statutes and Executive Orders require employers to abide by the Immigration laws of the United States and to employ only individuals who are eligible to work in the United States. The Employment Eligibility Verification System (E-Verify) operated by the U.S. Department of Homeland Security (DHS) in partnership with the Social Security Administration (SSA) to provides an internet-based means of verifying employment eligibility of workers in the united States; it is not a substitute for any other employment eligibility verification requirements.

- 10.2. Sub-Consultant/Contractor/Vendor requirement: Vendors shall require all subcontracted vendors to flow down the requirement to use E-Verify to sub-Consultant/Contractor/Vendors.
- 10.3. It shall be the vendor's responsibility to familiarize themselves with all rules and regulations governing this program.
- 10.4. For additional information regarding the Employment Eligibility Verification System (E-Verify) program visit the following website: <http://www.dhs.gov/E-Verify>.

11. ENERGY POLICY AND CONSERVATION ACT

- 11.1. Consultant/Contractor/Vendor must follow any mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6201).

12. SMALL AND MINORITY BUSINESS, WOMEN'S BUSINESS ENTERPRISES, AND LABOR SURPLUS AREA FIRMS:

- 12.1. Place qualified small and minority businesses and women's business enterprises on solicitation lists.
- 12.2. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources.
- 12.3. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.
- 12.4. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises.
- 12.5. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises.
- 12.6. Requiring the prime Consultant/Contractor/Vendor, if subcontracts are to be let, to take the five previous affirmative steps.

13. DOMESTIC PREFERENCES FOR PROCUREMENT (2 C.F.R. § 200.322)

- 13.1. As appropriate and to the greatest extent consistent with law, state and non-state entities should, to the greatest extent practicable under its Grant Agency award, provide a preference for the purchase of goods, products or materials produced in the United States (including but not limited to iron, aluminum, steel, cement and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. 2 C.F.R. § 200.322 also provides specific definitions for "Produced in the United States" and "manufactured products" that Consultant/Contractor/Vendor should review.
- 13.2. For purposes of this section: (1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. (2) "Manufactured products" means items and construction materials composed in whole or in part of nonferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

14. PROHIBITION ON CONTRACTING FOR COVERED TELECOMMUNICATIONS OR

SERVICES (2 C.F.R. § 200.216)

14.1.2 C.F.R. § 200.216 prohibits state and non-state entities from obligating or expending loan or grant funds to procure or obtain, extend or renew a contract to procure or obtain, or enter into a contract (or extend or renew a contract) to procure or obtain, equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as a critical technology as part of any system as identified in Section 889 of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (FY 2019 NDAA), Pub. L. No. 115-232 (2018) and 2 C.F.R. §§ 200.216, 200.327, 200.471, and Appendix II to 2 C.F.R. Part 200. See Prohibitions on Expending Grant Agency Award Funds for Covered Telecommunications Equipment or Services- Interim Policy for additional information.

15. TERMINATION FOR CAUSE AND/OR CONVENIENCE:

15.1. HCS, by written notice to the Consultant/Contractor/Vendor, may terminate this Agreement with or without cause (for convenience), in whole or in part, when HCS determines in its sole discretion that it is in HCS's best interest to do so. In the event of termination the Consultant/Contractor/Vendor will not incur any new obligations for the terminated portion of the Agreement after the Consultant/Contractor/Vendor has received notification of termination.

15.2. If the Agreement is terminated before performance is completed, the Consultant/Contractor/Vendor shall be paid only for that work satisfactorily performed for which costs can be substantiated. Such payment, however, may not exceed an amount that is the same percentage of the Agreement price as the amount of work satisfactorily completed is a percentage of the total work called for by this Agreement. All work in progress shall become the property of HCS and shall be turned over promptly by the Consultant/Contractor/Vendor.

16. SUSPENSION AND DEBARMENT

16.1. This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such the Consultant/Contractor/Vendor is required to verify that none of the Consultant/Contractor/Vendor, its principals (defined at 2 C.F.R. § 180.995), or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. §180.935).

16.2. The Consultant/Contractor/Vendor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

16.3. This certification is a material representation of fact relied upon by the awarded Consultant/Contractor/Vendor. If it is later determined that the Consultant/Contractor/Vendor did not comply with 2 C.F.R. pt.180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to HCS, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

16.4. The Consultant/Contractor/Vendor agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

17. RECOVERED MATERIALS

17.1. In the performance of this contract, the Consultant/Contractor/Vendor shall make maximum use of products containing recovered material that are EPA-designated items unless the product cannot be acquired:

- Competitively within a timeframe providing for compliance with the contract performance schedule;

- Meeting contract performance requirements; or
- At a reasonable price.

17.2. Information about this requirement is available EPA'S Comprehensive Procurement Guidelines web site, <http://www.epa.gov/cpg/> The list of EPA- designate items is available at <http://www.epa.gov/cpg/products/htm>

18. REMEDIES

18.1. In the event the Consultant/Contractor/Vendor fails to satisfactorily perform or has failed to adhere to the terms and conditions under this Agreement, HCS may, upon fifteen (15) calendar days written notice to the Consultant/Contractor/Vendor and upon the Consultant/Contractor/Vendor's failure to cure within those fifteen (15) calendar days, exercise any one or more of the following remedies, either concurrently or consecutively:

18.1.1. Withhold or suspend payment of all or any part of a request for payment.

18.1.2. Require that the Consultant/Contractor/Vendor refund to HCS any monies used for ineligible purposes under the laws, rules and regulations governing the use of these funds.

18.1.3. Exercise any corrective or remedial actions, to include but not be limited to:

18.1.4. Requesting additional information from the Consultant/Contractor/Vendor to determine the reasons for or the extent of non-compliance or lack of performance;

18.1.5. Issuing a written warning to advise that more serious measures may be taken if the situation is not corrected;

18.1.6. Advising the Consultant/Contractor/Vendor to suspend, discontinue or refrain from incurring costs for any activities in question; or

18.1.7. Requiring the Consultant/Contractor/Vendor to reimburse HCS for the amount of costs incurred for any items determined to be ineligible.

19. OTHER REMEDIES AND RIGHTS:

19.1. Pursuing any of the above remedies will not keep HCS from pursuing any other rights or remedies, which may be otherwise available under law or in equity. If HCS waives any right or remedy in this Agreement or fails to insist on strict performance by the Consultant/Contractor/Vendor, it will not affect, extend or waive any other right or remedy of HCS, or affect the later exercise of the same right or remedy by HCS for any other default by the Consultant/Contractor/Vendor.

19.2. Unless otherwise provided by the Contract, all claims, counter-claims, disputes and other matters in question between HCS and the Consultant/Contractor/Vendor arising out of or relating to the Agreement between the parties, or the breach of it, that cannot be resolved by and between the parties after conferring in good faith, will be decided by a court of competent jurisdiction pursuant to Tennessee law. If such dispute is in state court, venue shall be in the courts of Hamilton County.

20. CONTRACT WORK HOURS & SAFETY STANDARDS: For Agreements exceeding \$100,000 with use of mechanics or laborers.

20.1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or

mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

- 20.2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.
- 20.3. Withholding for unpaid wages and liquidated damages. The State of Tennessee Division of Emergency Management or equivalent office shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.
- 20.4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this section.
- 21. CLEAN AIR ACT:** For Agreements exceeding \$150,000.
- 21.1. The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.
- 21.2. The contractor agrees to report each violation to the Grant Agency and the Regional Office of the Environmental Protection Agency and understands and agrees that the Grant Agency and the Regional Office of the Environmental Protection Agency will, in turn, report each violation as required to assure notification to HCS, Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
- 21.3. The contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by Grant Agency.
- 22. FEDERAL WATER POLLUTION CONTROL ACT**
- 22.1. The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.
- 22.2. The contractor agrees to report each violation to the Grant Agency and the Regional Office of the Environmental Protection Agency and understands and agrees that the Grant Agency and the Regional Office of the Environmental Protection Agency will, in turn, report each violation as required to assure notification to HCS, Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

- 22.3. The contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by Grant Agency.

23. BYRD ANTI-LOBBYING AMENDMENT:

- 23.1. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with nonfederal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient. Consultant/Contractor/Vendors who apply or bid for an award of \$100,000 or more shall file the required certification.

24. CONTRACT CHANGES OR MODIFICATIONS

- 24.1. No alterations, amendment, changes, modifications or additions to any contract resulting from this bid shall be binding on HCS without the prior written approval of HCS.

25. RIGHTS TO INVENTIONS MADE UNDER AN AGREEMENT

- 25.1. If the Federal award meets the definition of "funding agreement" under 37 CFR §401.2 (a) and HCS enters into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the Agreement must comply with the requirements of [37 CFR Part 401](#), "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations.

26. CIVIL RIGHTS ASSURANCE STATEMENT

- 26.1. The vendor hereby agrees that it will comply with:

1. Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d et seq.);
2. Title IX of the Education Amendments of 1972 (20 U.S.C. 1681 et seq.);
3. Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794);
4. Age Discrimination Act of 1975 (42 U.S.C. 6101 et seq.);
5. Title II and Title III of the Americans with Disabilities Act (ADA) of 1990 as amended by the ADA Amendment Act of 2008 (42 U.S.C. 12131-12189);
6. Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency." (August 11, 2000);
7. Where USDA applies: All provisions required by the implementing regulations of the Department of Agriculture (USDA) (7 CFR Part 15 et seq.);
8. Department of Justice Enforcement Guidelines (28 CFR Parts 35, 42 and 50.3);
9. Where USDA applies: Food and Nutrition Service (FNS) directives and guidelines to the effect that, no person shall, on the grounds of race, color, national origin, sex, age, or disability, be excluded from participation in, be denied the benefits of, or otherwise be subject to discrimination under any program or activity for which the Program applicant receives Federal financial assistance from USDA; and hereby gives assurance that it will immediately take measures necessary to effectuate this Agreement.
10. Where USDA applies: The USDA non-discrimination statement that in accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs).

27. Where USDA applies:

(1) This assurance is given in consideration of and for the purpose of obtaining any and all Federal financial assistance, grants, and loans of Federal funds, reimbursable expenditures, grant, or donation of Federal property and interest in property, the detail of Federal personnel, the sale and lease of, and the permission to use Federal property or interest in such property or the furnishing of services without consideration or at a nominal consideration, or at a consideration that is reduced for the purpose of assisting the recipient, or in recognition of the public interest to be served by such sale, lease, or furnishing of services to the recipient, or any improvements made with Federal financial assistance extended to the Program applicant by USDA. This includes any Federal agreement, arrangement, or other contract that has as one of its purposes the provision of cash assistance for the purchase of food, and cash assistance for purchase or rental of food service equipment or any other financial assistance extended in reliance on the representations and agreements made in this assurance.

(2) Food service staff will be funded by School Nutrition funds, a non-federal entity subject to the provisions in 2 CFR 200. Therefore, the fees for food service positions cannot be quoted using cost plus a percentage of cost, per 2 CFR 200.324(d). The proposer must provide pricing for food service staff using a cost plus fixed-fee method. Other position types may be quoted using either pricing method.

END OF SECTION

SECTION 00 30 10 - BID FORM AND DOCUMENTS**Bid File #: 24-22****Form 1 (Page 1 of 3)**TO: **Hamilton County Department of Education**, hereinafter called "Owner"

1. The undersigned, having examined the Contract Documents titled:
MULTI-PURPOSE BUILDING FOR RIVERMONT ELEMENTARY SCHOOL dated , July 3, 2023.

As prepared by Hamilton County Department of Education, Division of Auxiliary Services; Chattanooga, Tennessee, and having visited the site and examined the conditions affecting the Work, hereby proposed and agrees to furnish all labor, materials, equipment, and appliances, and to perform operations necessary to complete the Work as required by said Contract Documents, for the lump sum of

Dollars (\$ _____)

2. The undersigned understands and agrees to comply with and be bound by instructions to bidders issued for this Work.
3. The undersigned acknowledges and includes in the bid the Lump Sum Allowance for General Purpose and the Material Quantity Allowances as described in Section 01 02 10- Allowances.
4. Add Alternate No. 1: Repave area indicated on Sheet C1.0 – Site Staking Plan with heavy duty asphalt paving section (Detail 2, Sheet C7.0).

Dollars (\$ _____)

5. Add Alternate No. 2: Provide two (2) additional stationary side-wall mounted basketball goals as shown on A1.0, A2.0, A3.0, and specified in Section 11 49 00- Gymnasium Equipment.

Dollars (\$ _____)

6. Unit Price #1: Provide a unit price for excavation of unsuitable soil and placement of compacted fill per cubic yard. This unit price will be used to determine the final cost of soil replacement required from that required by the contract documents base bid. The quantity, as determined by the soils engineer, times the unit price will add, deduct or remain unchanged from the contract sum. **Include 1000 cubic yards in the base bid.**

Dollars/Cubic Yard (\$ _____ /CY)

Form 1 (Page 2 of 3)

7. Unit Price #2: Provide a unit price for excavation of trench rock, removal from site and placement of compacted fill or stone per cubic yard. This unit price will be used to determine the final cost of trench rock removal and replacement with compacted fill or stone from that required by the contract documents base bid. The quantity, as determined by the soils engineer, times the unit price will add, deduct or remain unchanged from the contract sum. **Include 20 cubic yards in the base bid.**

Dollars/Cubic Yard (\$ _____ /CY)

8. The undersigned acknowledges receipt of Addenda numbers (Provide numbers and date):

| | | |
|----------|----------|----------|
| 1) _____ | 2) _____ | 3) _____ |
| 4) _____ | 5) _____ | 6) _____ |

9. Enclosed with this bid is bid security in the amount of not less than 5% of the bidder's maximum proposed Contract Sum.

10. The bidder agrees to honor this bid for a period of forty-five (45) days following the date of the scheduled opening of bids.

11. CONSTRUCTION TIME: _____ Two hundred forty (240) calendar days. _____
 Liquidated damages will be assessed at Two hundred (\$200) Dollars per day for each day project is not Substantially Complete in this time.
 Construction time is of the essence to this contract.

12. NOTICE TO PROCEED:
 The undersigned hereby agrees to commence work on this contract upon receipt of a written "Notice to Proceed" issued by Owner.

13. The Hamilton County Department of Education shall be listed on each insurance policy as additional insured.

14. **The undersigned agrees that 100% Performance and Payment Bonds and Certificates of Insurance as described in Section 00 80 00, Supplementary Conditions, Article 17, shall be deposited with the Hamilton County Department of Education only from the successful bidder before contract execution.**

15. The Bidder is hereby acknowledging that the following documents are attached to and made a condition of this Bid:

- | | |
|--|---|
| a) Form 2- Certificate of Compliance | e) Form 6- Iran Divestment Act Certification |
| b) Form 3- Authorization to Bind | f) Form 7- Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion |
| c) Form 4- Drug-Free Workplace Affidavit | |
| d) Form 5- Non-Collusion Affidavit | |

Form 1 (Page 3 of 3)

- g) Form 8- Certification of Compliance with Tennessee Public Chapter # 587
- h) Form 9- Required Bid Security in the form of: **5%** Bid Bond or Cashier's Check.
- i) Form 10- Funding Notice and Provisions
- j) Form 11- Certification Regarding Lobbying
- k) Form 12- Immigration Law Affidavit
- l) Appended to this section: Bid Envelope ID Form (to be attached to the outside of the Bid Envelope and filled out).

BIDDER:

by _____

address _____

License No. _____

License type _____

Bid dated this _____ day of _____ 20_____

Form 2

CERTIFICATE OF COMPLIANCE

By indication of the authorized signature below, the Proposer/Bidder does hereby make certification and assurance, under penalty of perjury, of the Proposer's/Bidder's compliance with all provisions of this bid/bid and the following items:

1. the laws of the State of Tennessee and Hamilton County;
2. Title VI of the Civil Rights Act of 1964;
3. Title IX of the Education Amendments of 1972
4. the condition that no amount shall be paid directly or indirectly to an employee or official of Hamilton County Department of Education as wages, compensation, or gifts in exchange for acting as an officer, agent, employee, subcontractor, or consultant to the Proposer/Bidder in connection with the procurement under this Bid/RFP.

Signed _____ Dated _____

Print Name _____ Email _____

Company _____ Telephone No. _____

Address _____ Fax No. _____

City _____ State _____ Zip _____

Form 3

AUTHORIZATION TO BIND

By signing this proposal, I certify and acknowledge that the information contained in this document is true and correct, containing **NO** misrepresentations. The information is **NOT** tainted by any collusion. I certify and acknowledge that I have reviewed and approved the release of this proposal/bid for HCS's consideration. Further, I am authorized to bind my company to the responses and pricing in these proposal/bid documents, and any subsequent negotiations, as well as execute the actual Contract documents, if selected.

Authorized Signature (Officer of the Company)

Name of Authorized Signer (Printed or Typed)

Title of Authorized Signer

Firm Name

Taxpayer Identification Number

Firm Address, City and Zip Code

Telephone Number

Fax Number

Email Address

Date

Form 4 (Page 1 of 2)

Drug-Free Workplace Requirements & Affidavit
TENNESSEE CODE ANNOTATED, § 50-9-113

- (1) Each Contractor or Subcontractor with no less than five (5) employees receiving pay shall submit an affidavit stating that such employer has a drug-free workplace program in effect at the time of submission of bids. Said program shall comply with Title 50, Chapter 9, TCA.
- (2) If it is determined that an employer subject to the provisions of this section has entered into a contract for this Project and does not have a drug-free workplace pursuant to the referenced requirements, such employer shall be prohibited from entering into another contract with any local government or state agency until such employer can prove compliance.
- (3) The written affidavit shall be submitted with the Construction Contractor's Bid Form, and the Bid shall not be considered complete if said affidavit is not included, and the Bid shall be rejected as Non-Responsive. For all other product or service contracts submission of the affidavit is encouraged only.
- (4) For purposes of compliance with this section, any private employer shall obtain a certificate of compliance with the applicable portions of the Drug-Free Workplace Act from the Department of Labor and Workforce Development.

Form 4 (Page 2 of 2)

(To be submitted with bid by construction contractor with 5 or more employees and encouraged for all others)

AFFIDAVIT

I _____, president or other principal

Officer of _____, swear or affirm that the
(Name of Company)

Company has a drug-free workplace program that complies with Title 50, Chapter 9, Tennessee Code Annotated, in effect at the time of this bid submission at least to the extent required of governmental entities. I further swear or affirm that the company is in compliance with the Tennessee Code Annotated, § 50-9-113.

Officer

President of Principal

For: _____

STATE OF TENNESSEE}
COUNTY OF _____}

Subscribed and sworn before me by _____,

President or principal officer of _____,

On this _____ day of _____, 20_____.

NOTARY PUBLIC

My Commission Expires: _____

Form 5 (Page 1 of 2)

Instructions for Non-Collusion Affidavit

- (1) This non-collusion affidavit is material to any contract awarded pursuant to this bid.
- (2) This non-collusion affidavit must be executed by the member, officer, or employee of the bidder who makes the final decision on prices and the amount quoted in the bid.
- (3) Bid rigging and other efforts to restrain competition, and the making of false sworn statements in connection with the submission of bids are unlawful and may be subject to criminal prosecution. The person who signs the Affidavit should examine it carefully before signing and assure himself or herself that such statement is true and accurate, making diligent inquiry, as necessary, of all other persons employed by or associated with the bidder with responsibilities for the preparation, approval or submission of the bid.
- (4) In the case of a bid submitted by a joint venture, each party to the venture must be identified in the bid documents, and an affidavit must be submitted separately on behalf of each party.
- (5) The term "complementary bid" as used in the Affidavit has the meaning commonly associated with that term in the bidding process, and includes the knowing submission of bids higher than the bid of another firm, and intentionally high or noncompetitive bid, and any other form of bid submitted for the purpose of giving a false appearance of competition.

Form 5 (Page 2 of 2)

Non-Collusion Affidavit (Attachment A)

State of _____

County of _____

I state that I am _____ of _____ (Title) (Name of Firm)

and that I am authorized to make this affidavit on behalf of my firm, and its owners, directors, and officers. I am the person responsible in my firm for the price(s) and the amount of this bid.

I state that:

- (1) The price(s) and amount of this bid have been arrived at independently and without consultation, communication or agreement with any other contractor, bidder, or potential bidder.
(2) Neither the price(s) nor the amount of this bid, and neither the approximate price(s) nor approximate amount of this bid, have been disclosed to any other firm or person who is a bidder or potential bidder, and they will not be disclosed before bid opening.
(3) No attempt has been made or will be made to induce any firm or person to refrain from bidding on this contract, or to submit a bid higher than this bid, or to submit any intentionally high or noncompetitive bid or other form of complementary bid.
(4) The bid of my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive bid.
(5) _____, its affiliates, subsidiaries, officers, directors and employees are not currently under investigation by any governmental agency and have not in the last three years been convicted or found liable for any act prohibited by State or Federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding on any public contract, except as follows:

I state that _____ understands and acknowledges that the (Name of my Firm)

above representation are material and important and will be relied on by Hamilton County Department of Education in awarding the contract(s) for which this bid is submitted. I understand and my firm understands that any misstatement in this affidavit is and shall be treated as fraudulent concealment from Hamilton County Department of Education of the true facts relating to submission of bids for this contract.

(Signature and Company Position)

SWORN TO AND SUBSCRIBED BEFORE ME THIS _____ DAY OF _____, 20 _____

NOTARY PUBLIC:

My Commission Expires: _____

Form 6 (Page 1 of 2)

**CERTIFICATION OF COMPLIANCE WITH
THE IRAN DIVESTMENT ACT**

Effective July 1, 2016, this form must be submitted for any contract that is subject to the Iran Divestment Act, Tenn. Code Ann. § 12-12-101, et seq., ("Act"). This form must be submitted with any bid or bid regardless of where the principal place of business is located.

Pursuant to the Act, this certification must be completed by any corporation, general partnership, limited partnership, limited liability partnership, joint venture, nonprofit organization, or other business organization that is contracting with a political subdivision of the State of Tennessee.

Certification Requirements.

No state agency or local government shall enter into any contract subject to the Act, or amend or renew any such contract with any bidder/contractor who is found ineligible under the Act.

Complete all sections of this certification and sign and date it, under oath, in the presence of a Notary Public or a person authorized to take an oath in another state.

Form 6 (Page 2 of 2)

CERTIFICATION:

I, the undersigned, certify that by submission of this bid, each bidder and each person signing on behalf of any Respondent certifies, and in the case of a joint bid or contract each party thereto certifies, as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to Tenn. Code Ann. § 12-12-106.

Respondent represents it has the full power, knowledge, and authority to make this Certification and that the signatory signing this Certification on behalf of bidder/contractor has been duly authorized to do so on behalf of the bidder/contractor.

Sworn as true to the best of my knowledge and belief, subject to the penalties of false statement.

Company Name

Signature of Authorized Official

State of _____

County of _____

The foregoing instrument was signed and acknowledged before me, by means of physical presence or personally known, this _____ day of _____, 20____, by

_____ who has produced _____
as identification.

(Print or Type Name)

(Type of Identification and Number)

Notary Public Signature

Printed Name of Notary Public

Notary Commission Number/Expiration

The signee of these Affidavit guarantees, as evidenced by the sworn affidavit required herein, the truth and accuracy of this affidavit to interrogatories hereinafter made.

Form 7

**Hamilton County Board of Education
Certification Regarding Debarment, Suspension,
Ineligibility and Voluntary Exclusion**

The prospective participant / vendor certifies, by submission of this bid, that neither it nor its Principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal Department or agency.

Where the prospective participant / vendor is unable to certify to any of the statements in this Certification, such prospective participant / vendor shall attach an explanation to this bid.

Organization Name

Name(s) and Title(s) of Authorized Representative(s)

Signature

Form 8

**Certification of Compliance with
Tennessee Public Chapter # 587**

The General Assembly of the State of Tennessee requires any person, corporation or other entity who enters into or renews a contract with a local board of education comply with Tennessee Public Chapter #587 (TPC587).

TPC587 requires persons, employees of the person or corporation that have direct contact with school children or access to school grounds when children are present to have supplied to the corporation a fingerprint sample and have conducted a criminal history records check by the Tennessee Bureau of Investigation and the Federal Bureau of Investigation prior to permitting the person to have contact with such children or enter school grounds. (The Public Chapter 1080, (D) was amended to: "A person whose contract is for the performance of a service at a school-sponsored activity, assembly or even at which school officials or employees are present when the service is performed and where the activity, assembly, or event is conducted under the supervision of school officials or employees."

TPC587 provides guidance for employees who have been convicted of an offense that is classified as a sexual offense or a violent sexual offense.

I have read the attached TENNESSEE PUBLIC CHAPTER # 587 and certify compliance with the regulations.

Name/Address of Organization

Name/Title of Submitting Official

Signature

Date

Form 9 (AIA form A310 is also acceptable)

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,

As Principal, and _____
as Surety, are hereby held and firmly bound unto Hamilton County Department of Education, Tennessee
as Owner in the penal sum of _____ for the payment of which, well and truly to be
made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed, this _____ day of _____, 20____.

The condition of the above obligated is such that whereas the Principal has submitted to Hamilton County Department of Education, Tennessee, a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing for the Project known as: BID 24-22 MULTI-PURPOSE BUILDING FOR RIVERMONT ELEMENTARY SCHOOL.

NOW, THEREFORE,

- (a) If said Bid shall be rejected, or in the alternate.
- (b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection herewith, and shall in all other respects perform the agreement created by the acceptance of said Bid, then this obligation shall be void, otherwise shall remain in force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

Surety (L.S.)

By: _____ Principal

Title

SEAL

Note: Bond may be declared invalid if not accompanied by Power of Attorney.

Form 10



FUNDING NOTICE & PROVISIONS

NOTICE: the services being requested and the associated Agreement are funded in whole or in part with Federal funds in addition to general funds of the agency. As such, the applicable federal provisions of Appendix II, supported and enforced by the 2 CFR Part 200.327, and provided within this Funding Notice & Provisions section shall apply to the Agreement and where/as applicable to the Work performed.

Consultant/Contractor/Vendor agrees, through signature and certification provided below, to abide by and comply with all Federal terms, conditions, provisions, certifications, affidavits, or otherwise as applicable and stated herein and further agrees to incorporate all such clauses, provisions, and regulations into any sub-contracted agreements or equivalent business relationships the Consultant/Contractor/Vendor creates to support the Consultant/Contractor/Vendor's servicing to HCS.

When the funding source or the applicability of any provision provided herein is not clear, it shall be the sole responsibility of the Consultant/Contractor/Vendor to clarify any such items with the HCS authorized Project Manager or Sponsoring Department prior to omitting or not performing any action or requirement.

Name & Address of Consultant/Contractor/Vendor

Name & Title of Submitting Authorized Official

Signature of Authorized Official

Date

Form 11 (Page 1 of 2)

CERTIFICATION REGARDING LOBBYING

Applicable to Grants, Subgrants, Cooperative Agreements, and Contracts Exceeding \$100,000 in Federal Funds.

Submission of this certification is a prerequisite for making or entering into this transaction and is imposed by section 1352, title 31, U.S. Code. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of a Federal contract, the making of a Federal grant, the making of a Federal loan, the entering into of a cooperative agreement, and the extension, continuation, renewal, amendment, or modification of a Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all covered sub awards and that all sub recipients shall certify and disclose accordingly to undersigned.

Name & Address of Consultant/Contractor/Vendor

Name & Title of Submitting Authorized Official

Signature of Authorized Official

Date

Complete only as applicable.

DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C.1352

Approved by OMB
4040-0013

| | | |
|---|--|--|
| <p>1. * Type of Federal Action:</p> <input type="checkbox"/> a. contract <input checked="" type="checkbox"/> b. grant <input type="checkbox"/> c. cooperative agreement <input type="checkbox"/> d. loan <input type="checkbox"/> e. loan guarantee <input type="checkbox"/> f. loan insurance | <p>2. * Status of Federal Action:</p> <input type="checkbox"/> a. bid/offer/application <input checked="" type="checkbox"/> b. initial award <input type="checkbox"/> c. post-award | <p>3. * Report Type:</p> <input checked="" type="checkbox"/> a. initial filing <input type="checkbox"/> b. material change |
| <p>4. Name and Address of Reporting Entity:</p> <input checked="" type="checkbox"/> Prime <input type="checkbox"/> SubAwardee * Name: _____ * Street 1: _____ Street 2: _____ * City: _____ State: _____ Zip: _____ Congressional District, if known: _____ | | |
| <p>5. If Reporting Entity in No.4 is Subawardee, Enter Name and Address of Prime:</p> | | |
| <p>6. * Federal Department/Agency:</p> _____ | | <p>7. * Federal Program Name/Description:</p> _____ CFDA Number, if applicable: _____ |
| <p>8. Federal Action Number, if known:</p> _____ | | <p>9. Award Amount, if known:</p> \$ _____ |
| <p>10. a. Name and Address of Lobbying Registrant:</p> Prefix: _____ * First Name: _____ Middle Name: _____ * Last Name: _____ Suffix: _____ * Street 1: _____ Street 2: _____ * City: _____ State: _____ Zip: _____ | | |
| <p>b. Individual Performing Services (including address if different from No. 10a)</p> Prefix: _____ * First Name: _____ Middle Name: _____ * Last Name: _____ Suffix: _____ * Street 1: _____ Street 2: _____ * City: _____ State: _____ Zip: _____ | | |
| <p>11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when the transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.</p> | | |
| <p>* Signature: _____</p> <p>* Name: Prefix: _____ * First Name: _____ Middle Name: _____ * Last Name: _____ Suffix: _____</p> <p>Title: _____ Telephone No.: _____ Date: _____</p> | | |
| <p>Federal Use Only:</p> | | <p>Authorized for Local Reproduction Standard Form - LLL (Rev. 7-97)</p> |

Form 12

Attachment: Immigration Law Affidavit Certification

This Affidavit is required and should be signed by an authorized principal of the Consultant/Contractor/Vendor and submitted with HCS Procurements where applicable. Further, Consultant/Contractor/Vendor are required to enroll in the E-Verify program, and provide acceptable evidence of their enrollment, upon request by HCS personnel. Acceptable evidence consists of a copy of the properly completed E-Verify Company Profile page or a copy of the fully executed E-Verify Memorandum of Understanding for the company.

HCS will not intentionally award HCS contracts to any vendor who knowingly employs unauthorized alien workers, constituting a violation of the employment provision contained in 8 U.S.C. Section 1324 a(e) Section 274A(e) of the Immigration and Nationality Act ("INA").

HCS may consider the employment by any vendor of unauthorized aliens a violation of Section 274A (e) of the INA. Such Violation by the recipient of the Employment Provisions contained in Section 274A (e) of the INA shall be grounds for unilateral termination of the contract by HCS.

Vendor attests that they are fully compliant with all applicable immigration laws (specifically to the 1986 Immigration Act and subsequent Amendment(s)) and agrees to comply with the provisions of the Memorandum of Understanding with E-Verify and to provide proof of enrollment in The Employment Eligibility Verification System (E-Verify), operated by the Department of Homeland Security in partnership with the Social Security Administration at any time upon request by HCS.

Name & Address of Consultant/Contractor/Vendor

Name & Title of Submitting Authorized Official

Signature of Authorized Official

Date

END OF SECTION

Affix this page to your sealed solicitation envelope to identify it as a "Sealed Submission/Proposal".

| | |
|---|--|
| PROPOSAL DOCUMENTS • DO NOT OPEN | |
| SOLICITATION No.: | BID 24-22 |
| SOLICITATION TITLE: | Multi-purpose Building for Rivermont Elementary School |
| OPENING/DUE DATE: | August 1, 2023 |
| TIME DUE: | 2:00 PM |
| SUBMITTED BY: | _____ |
| | (Name of Company) |
| DELIVER TO: | Hamilton County Board of Education Attn: Purchasing Department 3074 Hickory Valley Road Chattanooga, TN 37421 |
| <small>e-mail address</small> | <small>Telephone</small> |

CONTRACTOR LICENSING DETAILS

Prime Contractor:

- Name: _____
- Address: _____
- TN Contractor's License Number: _____
- License Expiration Date: _____
- License Category of Classification: _____

HVAC Contractor:

- Name: _____
- Address: _____
- TN Contractor's License Number: _____
- License Expiration Date: _____
- License Category of Classification: _____

Masonry Contractor:

- Name: _____
- Address: _____
- TN Contractor's License Number: _____
- License Expiration Date: _____
- License Category of Classification: _____

Electrical Contractor:

- Name: _____
- Address: _____
- TN Contractor's License Number: _____
- License Expiration Date: _____
- License Category of Classification: _____

Other Contractor: _____

- Name: _____
- Address: _____
- TN Contractor's License Number: _____
- License Expiration Date: _____
- License Category of Classification: _____

***Notices:**

- The Date Due/Submission Deadline Date/Opening Date as stated on this label and other forms contained herein may have been updated via issuance of Addenda against this project. It is the sole responsibility of the Contractor/Vendor to monitor the HCS solicitation for any updates to the Date Due/Submission Deadline Date/Opening Date via Addenda. This label or other original forms may not be updated. Contractor/Vendor may strike through and update Date Due/Submission Deadline Date/Opening Date at their discretion to match any updates to this date that have been published via Addenda.
- Submissions received after the time and date of the Date Due/Submission Deadline Date/Opening Date will not be accepted at the sole discretion of HCS.
- Some submissions may require the Vendor to provide the company name, Tennessee Contractor's license number, expiration date, license classification and company address on the outside of the sealed bid envelope in accordance with TCA 62-6-119. Where this is requested within the project documents the Vendor is solely responsible for compliance with this request.
- Please print clearly.

DOCUMENT 00 31 32 - GEOTECHNICAL DATA**1.1 GEOTECHNICAL DATA**

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.
- C. Soil-boring data for Project, obtained by GEOServices, LLC, dated February 21, 2023, is available for viewing as appended as a link to this Document.
- D. A geotechnical investigation report for Project, prepared by GEOServices, LLC, dated February 21, 2023, is available for viewing as appended as a link to this Document.
 - 1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analysis conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
 - 2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.
- E. Related Requirements:
 - 1. Document 00 10 00 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF DOCUMENT 00 31 32



41-23132 Geotech
Report Rivermont El

[Link to Geotechnical Report and Borings](#)

Section 00 70 00-General Conditions of the Contract

DRAFT AIA® Document A201™ - 2017**General Conditions of the Contract for Construction****for the following PROJECT:***(Name and location or address)*

«MULTI-PURPOSE BUILDING
 Rivermont Elementary School»
 «3330 Hixson Pike
 Chattanooga, Tennessee 37415 »

THE OWNER:*(Name, legal status and address)*

«Hamilton County Department of Education »« »
 «3074 Hickory Valley Road »
 «Chattanooga, TN 37421 »

THE ARCHITECT:*(Name, legal status and address)*

«Daniel L. Floyd »« »
 «2501 Dodds Avenue »
 «Chattanooga, TN 37407 »

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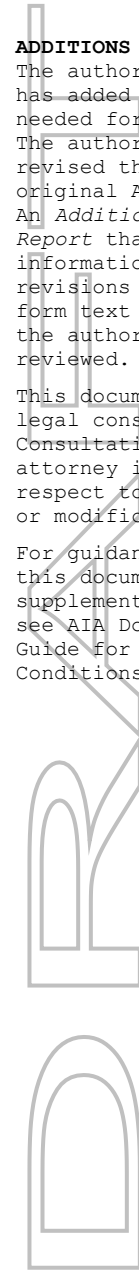
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ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.



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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal 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 Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. 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 and 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 that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 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.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

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 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or

relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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 Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, 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.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 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.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly 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 Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

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 Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 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 its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a 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.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as

the information furnished by the Owner pursuant to Section 2.3.4, 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 coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. 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.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 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. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be 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 notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 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 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

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

§ 3.5 Warranty

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

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that 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, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that 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 that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect 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 Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. 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 to 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; and
- .3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and

similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 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 or a Subcontractor, Sub-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 that 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. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, 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.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) 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 Architect.

§ 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 the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

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

§ 3.12.10 The Contractor shall not be required to provide professional services that 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.

§ 3.12.10.1 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 Architect will

specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and 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.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 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. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed 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 construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

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 Architect harmless from loss on account thereof, but shall not be responsible for 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 Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect'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 that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 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 or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility 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.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect 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

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect 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 Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of 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 Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect 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 decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. 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 the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term “Sub-subcontractor” is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect 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 Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect 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 such change, and an appropriate Change Order 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 substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, 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 the responsibility for safety of the Subcontractor’s Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect 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 Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

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

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

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 term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 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 shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its 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.

§ 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 or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 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 for 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 notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work 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. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 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 Section 3.14.

§ 6.3 Owner's Right to Clean Up

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 Architect will allocate the cost among those responsible.

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 Change Order, Construction Change Directive or order 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 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. 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.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

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 Architect in accordance with Section 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, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

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

§ 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 (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

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.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or 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 in the Work. 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. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 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, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. 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 Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect 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 Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 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 suppliers 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 a Separate Contractor;
 - .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 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 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by 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, 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.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 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 sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 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 prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect'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 for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. 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 when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, 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 required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect 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 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with 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 Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for 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, (3) a written statement that the Contractor knows of no 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) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, 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 refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance 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 the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the 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 Architect 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.

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

- .1 liens, 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;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 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;

- 2 the 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, a Subcontractor, or a Sub-subcontractor; and
- 3 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 comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and 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 implement, 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 the owners and users of adjacent sites and utilities of the safeguards.

§ 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 Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-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 under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect 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 under Section 3.18.

§ 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 Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party 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, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and 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 the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed 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 cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed

by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect'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 in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, 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), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, 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 Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 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 authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the

procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance – No insurance purchased by the Owner.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 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 the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

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 Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect'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 that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect'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 Section 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 Section 9.9.1, or by terms of any 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 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 Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 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 completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that 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 of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 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.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that 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 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, 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 a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, 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 of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect 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 Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 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 Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 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 Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

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 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 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 reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly 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 additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written 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 Section 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 Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. 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 Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for 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 under Section 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 notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and 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 and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract 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. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 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.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 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.

§ 15.1.7 Waiver of 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

- .1 damages incurred by the 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 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

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 Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a 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) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the

Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker 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 Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, 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 Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Resolution of Certain Payment Disputes

(See inserted text from Section 00 80 00 Supplementary Conditions.)

SECTION 00 80 00 - SUPPLEMENTARY GENERAL CONDITIONSSC - 0 GENERAL

SC - 0.1 These Supplementary General Conditions amend or supplement the General Conditions of the Contract for Construction, AIA Document A201-2017, and other provisions of the Contract Documents as indicated below. All provisions, which are not so amended or supplemented, shall remain in full force and effect.

Any provision of these Supplemental General Conditions, which pertains to a nonexistent condition and is not applicable to the work to be performed hereunder shall have no meaning in these Contract Documents and shall be disregarded.

SC - 0.2 General Conditions: The General Conditions are general in scope and may refer to conditions not encountered on the work covered by these Contract Documents. Any provision of the General Conditions which pertains to a nonexistent condition and is not applicable to the work to be performed hereunder, or which conflicts with any provision of the Supplementary General Conditions or Specifications, shall have no meaning in these Contract Documents and shall be disregarded.

SC - 0.3 Specifications: No attempt has been made in the Specifications to segregate work to be performed by any trade or subcontract. Any segregation between the trades or crafts will be solely a matter for agreement between the Contractor and his employees and his subcontractors.

The Specifications as a whole will govern the construction of the entire work. The applicable provisions thereof will govern work to be performed under each section.

SC - 0.4 Legal Addresses: Both the business address of the Contractor given in the Bid Form and the Contractor's office in the vicinity of the work either of which are hereby designated as the place to which all notices, letters, and other communication to the Contractor will be mailed or delivered.

The address of the Owner's Representative is 2501 Dodds Avenue, Chattanooga, Tennessee 37407. This address is hereby designated as the place to which all notices, letters, and other communication to the Owner shall be mailed or delivered. Either party may change his address at any time by an instrument in writing delivered to the other party.

SC - 0.5 Independent Contractor: The relation of the Contractor to the Owner shall be that of an independent contractor.

SC - 0.6 Governing Standard Specifications: Standard specifications or other specifications of organizations, societies, governmental agencies, or bodies, referred to in these Contract Documents, are made a part of these Contract Documents the same as if repeated herein. Unless specifically stated otherwise, the standard shall be that adopted and published at the date of the Advertisement for Bids.

SC - 0.7 The Contractor will not discriminate in the hiring, training, promotion, or termination of employees on the basis of race.

ARTICLE 3 – INDEMNIFICATION

ADD NEW SUBPARAGRAPH:

3.18.3 It is understood and agreed that the Contractor shall be deemed and considered an independent contractor in respect to the work covered by these Contract Documents and shall assume all risks and responsibility for casualties of every description in connection with the work, except that he shall not be held liable or responsible for delays or damage to work caused by acts of God, acts of public enemy, quarantine restrictions, general strikes throughout the trade, or freight embargoes not caused or participated in by the Contractor. The Contractor shall have charge and control of the entire work until completion and final acceptance of the work by the Owner. The Contractor shall be alone liable and responsible for, and shall pay, any and all loss and damages, including attorney's fees, sustained by any person either during the performance or subsequent to the completion of the work covered by these Contract Documents, by reason of injuries to person and damage to property, buildings, and adjacent work, that occur either during the performance or subsequent to the completion of the work covered by these Contract Documents, or that may be sustained as a result or consequence thereof, respective of whether or not such injuries or damage be due to negligence or to the inherent nature of the work. The Contractor shall fully indemnify, protect, defend, and save harmless forever the Owner, the Architect, and their agents or employees from any and all liability and from all suits and actions of every kind and description brought or which may be brought against them or any of them relative to the performance of the work or other responsibilities of the Contractor under these Contract Documents.

ARTICLE 7 - CHANGES IN THE WORK

ADD NEW SUBPARAGRAPH 7.2.2:

7.2.2 Before each Change Order is issued the General Contractor shall submit to the Architect a proposal, which shall be a complete itemized breakdown of the following:

- 7.2.1 Quantities of material
- 7.2.2 Unit cost of material
- 7.2.3 Rental cost of machinery and equipment, exclusive of hand tools
- 7.2.4 Total hours for each classification of labor
- 7.2.5 Hourly rates applicable for all labor classifications
- 7.2.6 Social Security, Old Age and Unemployment insurance
- 7.2.7 Additional cost of supervision and field personnel ONLY if there is an extension of Contract Time
- 7.2.8 Contractor's allowance for overhead and profit
- 7.2.9 Total cost to Owner
- 7.2.10 Number of Calendar days (if any) required to complete the additional Work
- 7.2.11 The allowance for overhead and profit combined, included in the total cost to the Owner shall be based upon the following schedule:

1. For the Contractor, for any Work performed by his own forces, a total markup of fifteen percent (15%): ten percent (10%) overhead plus five percent (5%) profit
2. For each Subcontractor involved, for Work performed by his own forces, a

total subcontractor markup of fifteen percent (15%): ten percent (10%) overhead plus five percent (5%) profit of the cost of the subcontractor's work. The Contractor may add five percent (5%) to the total subcontractor's sum.

3. Costs shall be limited to the following: Cost of materials including sales tax and cost of delivery cost of labor, including Social Security, Old Age and Unemployment Insurance (labor cost may include a pro-rata share of foreman's time, only in case an extension of Contract Time is granted on account of the change); Workmen's Compensation Insurance, rental value of power tools and equipment
4. Overhead shall include the following: Bond premiums, supervision, project management, superintendence (unless the change includes an extension of Contract Time), wages of time keeper, watchmen and clerks, small tools, incidentals, general office expense including estimating, and all other expenses not included in "Cost" The cost as used herein shall include all items of labor, materials and equipment
5. If the net value of a change results in a credit from the Contractor or Subcontractor, the credit given shall be the net cost without overhead or profit.

DELETE PARAGRAPHS 7.3.4.1 THROUGH 7.3.4.5 IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING:

- 7.3.4.1 Quantities of material
- 7.3.4.2 Unit cost of material
- 7.3.4.3 Rental cost of machinery and equipment, exclusive of hand tools
- 7.3.4.4 Total hours for each classification of labor
- 7.3.4.5 Hourly rates applicable for all labor classifications
- 7.3.4.6 Social Security, Old Age and Unemployment insurance
- 7.3.4.7 Additional cost of supervision and field personnel ONLY if there is an extension of Contract Time
- 7.3.4.8 Contractor's allowance for overhead and profit
- 7.3.4.9 Total cost to Owner
- 7.3.4.10 Number of Calendar days (if any) required to complete the additional Work
- 7.3.4.11 The allowance for overhead and profit combined, included in the total cost to the Owner shall be based upon the following schedule:
 1. For the Contractor, for any Work performed by his own forces, a total markup of fifteen percent (15%): ten percent (10%) overhead plus five percent (5%) profit
 2. For each Subcontractor involved, for Work performed by his own forces, a total subcontractor markup of fifteen percent (15%): ten percent (10%) overhead plus five percent (5%) profit of the cost of the subcontractor's work. The Contractor may add five percent (5%) to the total subcontractor's sum.
 3. Costs shall be limited to the following: Cost of materials including sales tax and cost of delivery cost of labor, including Social Security, Old Age and Unemployment Insurance (labor cost may include a pro-rata share of foreman's time, only in case an extension of Contract Time is granted on account of the change); Workmen's Compensation Insurance, rental value of power tools and equipment

4. Overhead shall include the following: Bond premiums, supervision, project management, superintendence (unless the change includes an extension of Contract Time), wages of time keeper, watchmen and clerks, small tools, incidentals, general office expense including estimating, and all other expenses not included in "Cost" The cost as used herein shall include all items of labor, materials and equipment
5. If the net value of a change results in a credit from the Contractor or Subcontractor, the credit given shall be the net cost without overhead or profit.

ARTICLE 9 – PAYMENTS AND COMPLETION

ADD NEW SUBPARAGRAPHS:

9.6.1.1 Until Substantial Completion, the Owner shall pay ninety- five (95%) percent of the amount certified by the Architect, holding the remaining five (5%) percent as retainage. At Substantial Completion and with the full knowledge and consent of the Contractor's Surety, retainage shall be reduced to an amount sufficient, in the Architect's opinion, to complete the Work should the Contractor default.

9.6.2.1 Payments to Contractors - CONTRACTOR shall pay to each subcontractor engaged in the Project any incremental payments received from the County due to any subcontractor for satisfactory performance of their duties within fifteen (15) days of the Contractor's receipt of the same. Additionally, any and all retainage payment(s) due to a subcontractor by the Contractor shall be paid within fifteen (15) days of the Contractor's retainage payment for the successful completion of the Project.

Upon the Owner's receipt of written notice of the Contractor's failure to promptly pay all subcontractors according to this Contract for work satisfactorily performed at the appropriate stage of completion of the work, the Owner shall initiate an investigation into said allegations. Should said investigation substantiate the allegations charged against the Contractor, the Contractor shall be afforded five (5) working days in which to correct the matter. Failure of the Contractor to correct the matter within said five (5) day period shall result in a financial penalty of Two Hundred Dollars (\$200.00) per day being assessed against the Contractor, retroactive to the date of the first occurrence of the Contractor's failure. Additionally, the amount of the Contractor's cooperation on any contract with Hamilton County Department of Education will be considered in the awarding of any bids on future contracts.

In the event "good cause" for any delay or postponement by the Contractor in payment of any funds due to a subcontractor shall be established, no penalties will be assessed against the Contractor.

ARTICLE 11 – INSURANCE AND BONDS

ADD THE FOLLOWING SUBPARAGRAPHS TO 11.1.1:

The Contractor shall maintain limits of liability no less than:

- .1 Commercial General Liability Insurance - \$1,000,000 per occurrence, \$3,000,000 General Aggregate limit for property damage and bodily injury. The service provider should indicate in its bid whether the coverage is provided on a claims-made or preferably on an occurrence basis. The insurance shall include coverage for the following:
 - a) Premise/Operations
 - b) Products/Completed Operations
 - c) Personal Injury
 - d) XCU coverage, where applicable
 - e) Contractual Liability
 - f) Independent Contractors
 - g) Broad Form Property Coverage
- .2 Business Automobile Liability Insurance - \$1,000,000 per accident for property damage and personal injury.
 - a) Owned/Leased Autos
 - b) Non-owned Autos
 - c) Hired Autos
- .3 Workers' Compensation and Employer's Liability Insurance - Workers' Compensation statutory limits as required by Tennessee Law. This policy should include Employer's Liability Coverage for \$1,000,000 per accident.
- .4 Builder's Risk Insurance/Products Completed Operations- The Contractor (not the Owner) shall purchase and maintain until completion and acceptance by the Owner, Builder's Risk Insurance at 100% replacement cost(s) value per specifications, plus any amounts added by Change Order. The insurance shall list and include as named insured the Owner (Hamilton County Board of Education), the Contractor, all subcontractors, and all sub-subcontractors. The deductible amount for each occurrence shall be at the discretion of the Contractor, identified to and approved by the Owner, and shall be paid by the Contractor. The Builder's Risk Insurance shall also provide coverage for all portions of the Work in transit and for temporary storage of portions of the Work to the value approved by the Architect in the Certificate for Payment. Coverage is to be written on a special perils form including theft of building materials.
- .5 Excess Liability following Primary Form \$2,000,000. All insurance must be occurrence based. Successful Bidder must add the Hamilton County Department of Education as an additional named insured by policy endorsement and provide a certificate of insurance evidencing such coverage and endorsement # for each additional named insured. An umbrella policy will be accepted if aggregate limits are lower than indicated.

ADD THE FOLLOWING SUBPARAGRAPHS TO 11.1:

11.1.5 Commercial General Liability and Automobile Liability Coverage

- a) Hamilton County Board of Education, members of its boards, commissions and committees, officers, agents, employees and volunteers are to be covered as insureds as respects: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, leased or used by the Contractor or premises on which Contractor is performing services on behalf of the County. The coverage shall contain no special limitations on the scope of protection afforded to Hamilton County Board of Education, members of the boards, commissions and committees, officers, agents, employees and volunteers.
- b) The Contractor's insurance coverage shall be primary insurance as respects Hamilton County Board of Education, members of its boards, commissions and committees, officers, agents, employees and volunteers. Any insurance or self-insurance maintained by Hamilton County Board of Education, members of its boards, commissions and committees, officers, agents, employees and volunteers shall be excess of Contractor's insurance and shall not contribute with it.
- c) Any failure to comply with reporting provisions of the policies shall not affect coverage provided to Hamilton County Board of Education, members of its boards, commissions and committees, officers, agents, employees and volunteers.
- d) Coverage shall state that Contractor's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.

11.1.6 All Coverages

- a) Verification of Coverage - Contractor shall furnish the County with certificates of insurance and with original endorsements affecting coverage required by this clause. The certificates and endorsements for each policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The certificates and endorsements are to be received and approved by the County before work commences. Additional certificates of insurance shall be filed with the Architect as well.
- b) Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled, reduced in coverage or in limits except after thirty (30) days prior written notice has been given to the Owner, attention of Daniel Floyd, AIA.
- c) In the event any insurance coverage should be canceled or allowed to lapse, the Contractor will not be permitted to work until adequate and satisfactory insurance is in effect. Failure to keep insurance policies in effect WILL NOT be cause for any claims for extension of time under this Contract.
- d) Deductibles and Self-Insured Retentions - Any deductibles or self-insured retentions must be declared to and approved by the County. At the option of the County, the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects Hamilton County Board of Education members of its boards, commissions and committees, officers, agents, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses, related investigation, claim administration and defense expenses.

11.1.7 Acceptability of Insurers - Insurance is to be placed with Tennessee admitted insurers rated B+10 or better by A.M. Best's rating service or as approved by Hamilton County Dept of Educations Risk Manager.

11.1.8 Subcontractors - Contractor shall include each of its subcontractors as insureds under the policies of insurance required herein or ensure that their subcontractors meet the minimum requirements for insurance specified herein.

11.1.9 Workers' Compensation and Employer's Liability and Property Coverage - The insurer shall agree to waive all rights of subrogation against Hamilton County Board of Education, member of its boards, commissions and committees, officers, agents, employees and volunteers for losses arising from activities and operations of Contractor in the performance of services under this Agreement.

ARTICLES 11.2 OWNER'S INSURANCE

DELETE THESE PARAGRAPHS IN THEIR ENTIRETY.

ARTICLE 15 – CLAIMS AND DISPUTES

DELETE ENTIRE TEXT OF SUBPARAGRAPHS 15.3, 15.4.1, 15.4.2, 15.4.3 AND 15.4.4 AND SUBSTITUTE NEW SUBPARAGRAPH 15.3 AS FOLLOWS:

15.3 Resolution of Certain Payment Disputes

15.3.1 In the event there arises any dispute(s) relative to the Contractor's performance of duties relating to payment of subcontractors for services performed by them in the overall project, Contractor hereby agrees that said dispute(s) shall be settled by binding arbitration as governed by the laws of the State of Tennessee. Contractor further agrees to cooperate in the selection of an arbitrator to hear the matter, and will not unreasonably delay in the selection of said arbitrator. Contractor further acknowledges that an appeal of any such arbitration decision shall be filed with a court within Hamilton County having appropriate jurisdiction pursuant to Tennessee Uniform Arbitration Act (T.C.A. 29-5-301).

END OF SECTION 00 80 00

SECTION 01 01 00 - SUMMARY OF WORK**PART 1 - GENERAL****1.01 WORK COVERED BY CONTRACT DOCUMENTS**

- A. Construction of a Multi-Purpose Building for Rivermont Elementary School. The building is a 5,856 square feet pre-engineered structure with a multi-purpose and gymnasium space, office, restrooms and storage. The building will have a complete HVAC system, plumbing, electrical, tele-communications and fire alarm systems.
- B. Related Requirements Specified Elsewhere:
 - 1. Cutting and Patching: Section 01 04 50
 - 2. Schedule of Values and Progress Schedule: Section 01 37 00
 - 3. Construction Facilities and Temporary Controls: Section 01 50 00
 - 4. Contract Closeout: Section 01 70 00
 - 5. Cleaning: Section 01 71 00
- C. Contractor's Duties:
 - 1. Except as specifically noted, provide and pay for:
 - a. Labor, materials, and equipment.
 - b. Tools, construction equipment, and machinery.
 - c. Other facilities and services necessary for proper execution and completion of work.
 - 2. Pay legally required sales, consumer and use taxes.
 - 3. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
 - a. Permits
 - b. Government fees
 - c. Licenses
 - 4. Given required notices.
 - 5. Comply with codes, ordinances, rules, regulation, order and other legal requirements of public authorities which bear on performance of work.
 - 6. Promptly submit written notice to Architects of observed variance of Contract Documents from legal requirements.
 - a. Appropriate modifications to Contract Documents will adjust necessary changes.
 - b. Assume responsibility for work known to be contrary to such requirements.
 - 7. Enforce strict discipline and good order among employees. Do not employ on work:
 - a. Unfit persons
 - b. Persons not skilled in assigned task.

8. General Contractor's Project Manager:
The General Contractor shall furnish a Project Manager, acceptable to the Owner, in addition to the job superintendent, who shall be responsible for the following:
 - a. Direct communication, observation, responsibility and control of all sub-contractors and suppliers.
 - b. To be a liaison between the Architect and all sub-contractors and material sub-contractors and material suppliers. The Architect and Owner do not communicate with or control the sub-contractors and material suppliers.
 - c. Thoroughly review, check, coordinate and approve all shop drawings and submittals.
 - d. Schedule and supervise all job site progress meetings. Job site meetings with all sub-contractors who have work in progress must be scheduled at least bi-weekly and the Architect and Owner must be notified at least two (2) days in advance.
 - e. Immediately report to the Architect any discrepancy, deficiency or deviation from the drawings and specifications.
 - f. Gather and assemble all information required for the preparation of Field Orders or Change Orders when required.
 - g. Maintain records for as-built drawings and all warranty information.
 - h. To be available to the Architect by phone and email at all times within one (1) day notice or call.

1.02 CONTRACTS

- A. Project will be constructed under a single contract under the direction of the General Contractor.
- B. The Owner reserves the right to award other contracts for additional work in connection with this project as required to install improvements, furnish, or equip the building.
- C. There shall be complete cooperation between Contractor and sub-contractors to ensure satisfactory progress and performance of the work.

1.03 COORDINATION WITH ARCHITECT/ENGINEER

- A. The Architect/Engineer will be on the site at required intervals during construction and will be available upon reasonable notification by Contractor.

1.04 WORK SEQUENCE

- A. Contractor shall submit with the Schedule of Values a schedule of work sequence for the major portions of work to be done. This schedule shall indicate the time work will commence and be completed on each separate portion.

1.05 CONTRACTOR’S USE OF PREMISES

- A. Subcontractors shall limit their use of the premises for work and storage, to allow for:
 - 1. Work by other subcontractors.
 - 2. Ongoing use of the facility for storage purposes.
- B. Coordinate use of premises under direction of the General Contractor with the Architect.
- C. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.

1.06 PARTIAL OWNER OCCUPANCY

- A. The Contractor shall allow the Owner to take possession of and use any completed or partially completed portion of the work, or to place and install as much of his own furniture and equipment during the progress of the work as is possible without interference before its entire completion; such possession and use of structure or work or such placing and installation of equipment, or both, shall not in any way evidence completion of the work or any part of it.
- B. After the specified time of completion, it shall be understood that the Owner will not be liable for any inconvenience caused the Contractor by the Owner’s occupancy.

1.07 OWNER FURNISHED PRODUCTS

- A. Products furnished and paid for by the Owner under separate contract shall be incorporated into the project by the Contractor.
- B. Owner’s Responsibilities:
 - 1. Promptly inspect product, record damaged or defective items.
 - 2. Handle products at the site, including uncrating and storage.
- C. Contractor’s Responsibilities:
 - 1. Protect products from exposure to elements and from damage.
 - 2. Repair or replace items damaged by Contractor as directed by the Owner.

1.08 SCOPE OF SPECIFICATIONS

- A. Use of the word “all” has generally been omitted, but coverage in all cases is intended to be complete, except where partial coverage is specifically indicated. In all such cases where the item is referred to in the singular number, it is

intended that such reference shall apply to as many such items as are required to complete the work.

- B. Use of the word “shall” has generally been omitted, but all requirements set forth are mandatory except where otherwise qualified.

1.09 SPECIFICATION EXPLANATION

- A. For the convenience of reference and to facilitate the letting of contracts and subcontracts, these specifications are separated into titled Divisions. Such separations shall not, however, operate to make the Architect/Engineer an arbitrator to establish limits to the contracts between the Contractor and Subcontractor.

1.10 CONDITIONS OF SURFACES

- A. It shall be the responsibility of each subcontractor to carefully inspect and examine surfaces or areas prepared to receive his work. Should they consider such surfaces or areas not proper or satisfactory for the installation or application of their work, they shall notify the Contractor in writing, with copy to Architect/Engineer. Should they proceed before proper corrections have been made, it shall be at their own risk and any subsequent corrections that may be ordered or required shall be at their expense.

1.11 PROTECTION OF EXISTING STRUCTURES

- A. The Contractor shall protect the existing structures in the area from damage caused by his work or workmen, and be responsible for any damage thus caused.
- B. The Contractor shall be responsible to repair or replace to its original condition all areas disturbed by construction, including, but not limited to, trees, drives, walks, lawns, landscaping, utilities, etc.

END OF SECTION

SECTION 01 02 10 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Material Quantity allowances.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At the Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by the Architect from the designated supplier.

1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show the actual quantities of materials delivered to the site for use in fulfillment of each allowance.

PART 2 - PRODUCTS (Not Applicable)**PART 3 - EXECUTION****3.1 PREPARATION**

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.2 SCHEDULE OF ALLOWANCES**A. Allowance No. 1:**

1. Include a lump sum General Purpose Allowance of Eighty Thousand Dollars (\$80,000.00) for use upon the Owner's Instructions.
2. The General Purpose Allowance shall be used only as directed for the Owner's purposes or only by Construction Change Directives that designate amounts to be charged to this allowance.
3. General Contractor's overhead and profit will not be allowed on items applied to the General Allowance. Subcontractor's overhead and profit will be allowed according to the Supplementary Conditions.
4. In the event all or part of this allowance is not directed to be utilized by the Owner, then that amount shall be credited to the Owner by Change Order at the end of the project.
5. This allowance is separate and apart from any allowances listed in other sections of the specification.

B. Allowance No. 2: Provide a material quantity allowance of 1000 cubic yards for excavation of unsuitable soil and replacement with compacted fill per cubic yard. This allowance is to be priced in accordance with Unit Price #1 as indicated in the Bid Form.

C. Allowance No. 3: Provide a material quantity allowance of 20 cubic yards for excavation of trench rock, removal from site and replacement with compacted fill or stone per cubic yard. This allowance is to be priced in accordance with Unit Price #2 as indicated in the Bid Form.

END OF SECTION

SECTION 01 03 00 - ALTERNATES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing Alternates.

1.3 DEFINITIONS

- A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.
- B. Notification: Immediately following the award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other Work of this Contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

1. Add Alternate No. 1: Repave area indicated on Sheet C1.0 – Site Staking Plan with heavy duty asphalt paving section (Detail 2, Sheet C7.0).
2. Add Alternate No. 2: Provide two (2) additional stationary side-wall mounted basketball goals as shown on A1.0, A2.0, A3.0, and specified in Section 11 49 00-Gymnasium Equipment.

END OF SECTION

SECTION 01 03 50 - ADDITIONAL PROJECT PROCEDURES**PART 1 - GENERAL****1.01 APPLICATION FOR PAYMENT**

- A. The form for applications shall be AIA Documents G720, Application and Certification and G703 Continuation Sheet. Submit the Application for Payment to the Designer in accordance with the schedule established by Conditions of the Contract and Agreement between the Owner and Contractor.
- B. The Continuation Sheets for the application shall be itemized with the line items and values of the Schedule of Values accepted by the Designer.
- C. Submit the original and three copies of each Application with three copies of an updated progress schedule, visitor's log and shop drawing log to the Designer.
- D. When the designer finds the Application properly completed and correct, he will transmit a certificate for payment to the Owner, with a copy to the Contractor. The Owner will pay the approved request fifteen (15) days following receipt of the request from the Designer.

1.02 CHANGE ORDER FORM AND PROCEDURES

- A. Change Orders shall be submitted on AIA Document G701. A detailed breakdown of cost is required. Signatures by all parties signing the original agreement form are required on each Change Order. No work required by a Change Order shall be accomplished prior to receiving written approval from the Owner.
- B. All cost estimates provided by the General Contractor shall be accompanied by certified backup documentation from each subcontractor whose work is affected.
- C. The General Contractor and Subcontractors will apply the appropriate amounts of Overhead and Profit to each Change Order in accordance with Section 00800 Supplementary General Conditions, Article 7. Note that General Contractor Overhead and Profit is not allowed on items paid with General Allowance funds.

1.03 SHOP DRAWING LOG

- A. The Contractor shall maintain a Shop Drawing Log identified with Project Name and project number showing the title of each submittal, date of submittal, date returned, and status. Submit copies of this Shop Drawing Log with each pay request.

1.04 VISITOR'S LOG

- A. The Contractor shall maintain a log in the field office to record visits by the Designer, his consultants and all official observers. This log shall become the official record of all job visits and shall show: Date, Time of arrival and departure, Name and who represented. The Owner will furnish a form upon request: however, the form is not required - only the information.
- B. The Contractor shall submit a copy of this log with each pay request indicating Project Name, Project Number, and period covered by log.

1.05 REQUEST FOR INFORMATION (RFI)

- A. The General Contractor's Project Manager or Superintendent shall initiate any questions or requests, regarding the Contract Documents or other aspect of the project to the Architect in writing by use of the RFI form following this specification section.
- B. After receipt of the "RFI", the Architect shall reach a decision with regard to the request and provide a written reply on the RFI in the space provided.
- C. The use of the RFI does not take the place of verbal communications between the Architect and Contractor, but will serve as a written record of these transactions.
- D. All RFI's shall be telefaxed or emailed between the Contractor and Architect.

PART 2 - PRODUCTS (Not Applicable)**PART 3 - EXECUTION (Not Applicable)**

**REQUEST FOR INFORMATION
Multi-Purpose Building for Rivermont Elementary School**

Date Submitted: _____

From: _____

To: _____ - Hamilton Co. Dept. of Ed.

Detailed Description of Request/Question:

Response Needed by: (Date)_____ (Time)_____

Response From Architect

Response Submitted: (Date)_____ (Time)_____

By: _____

SECTION 01 04 50 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for cutting and patching.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Summary of Work.
 - 2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - a. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 15 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Owner requires approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
 - 2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements, along with associated costs.
 - 3. List products to be used and firms or entities that will perform Work.
 - 4. Indicate dates when cutting and patching will be performed. Coordinate any required shut-downs with Owner's Project representative. 72 hour notice is required.
 - 5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted. 72 hour notice is required.
 - 6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.

7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.
 1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
 - a. Foundation construction.
 - b. Bearing and retaining walls.
 - c. Structural concrete.
 - d. Structural steel.
 - e. Lintels.
 - f. Structural decking.
 - g. Stair systems.
 - h. Miscellaneous structural metals.
 - i. Exterior curtain-wall construction.
 - j. Equipment supports.
 - k. Piping, ductwork, vessels, and equipment.
 - l. Structural systems of special construction in Division 13 Sections.
- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
 1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Membranes and flashings.
 - e. Fire protection systems.
 - f. Noise and vibration control elements and systems.
 - g. Control systems.
 - h. Communication systems.
 - i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction in Division 13 Sections.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

- A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
 - 1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.
1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
 4. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.
 4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.4 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01 06 10 - NON-DISCRIMINATION/MINORITY HIRING

1. In determining the suitability and acceptability of proposed bidders, the Hamilton Co. Dept of Education reserves the right to consider each bidder's commitment to hire minorities and/or subcontract with minority contractors, relative to certain phases of the contracted services.
2. Except to the extent permitted by Federal Laws and Regulations for a bona fide occupational qualification, the Contractor agrees as follows:
3. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, disability, national origin, sex, or age. The Contractor will take affirmative action to insure that applicants are employed and employees are treated during employment without regard to their race, creed, color, handicap, national origin, sex, or age. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination, rates of pay, or any other forms of compensation and selection for training.
4. The bidder/contractor agrees to comply with Title VI, as prescribed in the Civil Rights Act of 1964 (42 U.S.C. 2000(D)) and 28 CFR 42 et seq., which provides that "no person in the United States shall on the ground of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving Federal Financial Assistance."
5. The Contractor will, in all solicitations for employees or job orders for employees placed with any employment agency, union, or other firm or agency, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, disability, national origin, sex, or age. The words "equal opportunity employer" in all advertisements shall constitute compliance with this section.
6. The Contractor will include the provisions of the foregoing paragraphs in every subcontract or purchase order for goods or services that are subject matter of this Agreement. The Owner shall have the right, at his option, to cancel the Agreement in whole or in part.
7. The Contractor will contact the Chattanooga Urban League <http://ulchatt.net/> for assistance in providing minority job applicants. The Chattanooga Urban League shall be allowed to visit the jobsite to observe the minorities and to contact the Contractor if necessary to discuss the number of minorities employed.
8. The Contractor will have an affirmative action plan.

END OF SECTION 01 06 10

SECTION 01 20 00 - PROJECT MEETINGS**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. The Designer in concert with the Contractor shall schedule and administer a preconstruction meeting, and specially called meetings throughout the progress of the Work. The Contractor is responsible for the following:
 - 1. Prepare agenda for meetings.
 - 2. Make physical arrangements for meetings
 - 3. Record the minutes; include all significant proceedings and decisions.
 - 4. Reproduce and distribute copies of minutes within three days after each meeting.
 - a. To all participants in the meeting.
 - b. To all parties affected by decisions made at the meeting.
 - c. Furnish three (3) copies of minutes to the Designer.
- B. Representatives of Contractors, Subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. The Designer shall attend meetings to ascertain that work is expedited consistent with Contract Documents and the construction schedule.

1.2 PRECONSTRUCTION MEETING

- A. A Preconstruction meeting shall be scheduled at the project site within 15 days after date of Notice to Proceed.
- B. This meeting shall be attended by:
 - 1. Owner's representative
 - 2. The Designer and his professional consultants.
 - 3. Resident Project Representative.
 - 4. Contractor's Superintendent.
 - 5. Major Subcontractors
 - 6. Major Suppliers.
 - 7. Others as appropriate.
- C. The following is a suggested Agenda for this meeting:
 - 1. Review requirements of DIVISION 0 and 1 of the Project Manual.
 - 2. Projected Construction Schedules.
 - 3. Critical work sequencing.
 - 4. Major equipment deliveries and priorities.
 - 5. Project Coordination.
 - 6. Procedures and processing of:
 - a. Field Decisions
 - b. Submittals
 - c. Payroll submittals

- d. Change Orders and itemization of cost.
- e. Applications for Payment
- 7. Extension of time (weather data shall be based on US Weather Bureau statistics)
- 8. Adequacy of distribution of Contract Documents.
- 9. Procedures for maintaining Record Documents.
- 10. Use of premises.
- 11. Construction facilities, controls and construction aids.
- 12. Temporary utilities.
- 14. Safety and first aid procedures.
- 15. Security procedures.
- 16. Housekeeping procedures.

1.3 PROGRESS MEETINGS

- A. Progress Meetings shall be scheduled at the Project Site prior to the Contractor submitting each Application for Payment or when requested by the Designer.
- B. The meeting shall be attended by:
 - 1. The Owner's representative.
 - 2. The Designer and his professional consultants as needed.
 - 3. Subcontractors as appropriate to the agenda.
 - 4. Suppliers as appropriate to the agenda.
 - 5. Others, as required.
- C. The following is a suggested agenda for this meeting:
 - 1. Review of work progress since previous meeting.
 - 2. Application for Payment
 - 3. Field observations, problems, conflicts.
 - 4. Problems which impede construction schedule.
 - 5. Review of off-site fabrication and delivery/schedules.
 - 6. Corrective measures and procedures to regain projected schedule
 - 7. Revisions to construction schedule.
 - 8. Plan progress, schedule, during succeeding work period
 - 9. Coordination of schedules.
 - 10. Review submittal schedules: expedite as required.
 - 11. Maintenance of quality standards
 - 12. Other business, as required.

END OF SECTION

SECTION 01 27 00 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. See Division 1 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.

1.2 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

- A. Unit Price No. 1 – Excavation of unsuitable soil and provision of compacted fill:
 - 1. Description: Provide a unit price for excavation of unsuitable soil and placement of compacted fill per cubic yard. This unit price will be used to determine the final

cost of soil replacement required from that required by the contract documents base bid. The quantity, as determined by the soils engineer, times the unit price will add, deduct or remain unchanged from the contract sum. Section "31 20 00."

2. Unit of Measurement: cubic yards of excavation and compacted approved fill.
3. **Include 1000 cubic yards in the base bid.**

B. Unit Price No. 2 – Excavation of trench rock and provision of compacted approved fill:

1. Description: Provide a unit price for excavation of trench rock, removal from site and placement of compacted fill or stone per cubic yard. This unit price will be used to determine the final cost of trench rock removal and replacement with compacted fill or stone from that required by the contract documents base bid. The quantity, as determined by the soils engineer, times the unit price will add, deduct or remain unchanged from the contract sum. Section "31 20 00."
2. Unit of Measurement: cubic yards of excavation and compacted fill.
3. **Include 20 cubic yards in the base bid.**

END OF SECTION

SECTION 01 34 00 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submittal of Shop Drawings, Product Data, Samples, and other miscellaneous quality-control submittals.
- B. Shop Drawings include, but are not limited to, the following:
 - 1. Fabrication drawings.
 - 2. Installation drawings.
 - 3. Setting diagrams.
 - 4. Shopwork manufacturing instructions.
 - 5. Templates and patterns.
 - 6. Schedules.
 - a. Standard information prepared without specific reference to the Project is not Shop Drawings.
- C. Product Data include, but are not limited to, the following:
 - 1. Manufacturer's product specifications.
 - 2. Manufacturer's installation instructions.
 - 3. Standard color charts.
 - 4. Catalog cuts.
 - 5. Roughing-in diagrams and templates.
 - 6. Standard wiring diagrams.
 - 7. Printed performance curves.
 - 8. Operational range diagrams.
 - 9. Mill reports.
 - 10. Standard product operating and maintenance manuals.
- D. Samples include, but are not limited to, the following:
 - 1. Partial Sections of manufactured or fabricated components.
 - 2. Small cuts or containers of materials.
 - 3. Complete units of repetitively used materials.
 - 4. Swatches showing color, texture, and pattern.
 - 5. Color range sets.
 - 6. Components used for independent inspection and testing.
 - 7. Field samples.

- E. Quality-control submittals include, but are not limited to, the following:
 - 1. Design data.
 - 2. Certifications.
 - 3. Manufacturer's instructions.
 - 4. Manufacturer's field reports.

- F. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
 - 1. Permits.
 - 2. Applications for payment.
 - 3. Performance and payment bonds.
 - 4. Insurance certificates.
 - 5. Listing of subcontractors.

- G. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Contract Closeout" specifies requirements for submittal of Project Record Documents, including copies of final Shop Drawings, at project closeout.

1.3 DEFINITIONS

- A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.
 - 1. Preparation of Coordination Drawings is specified in Division 1 Section "Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

- B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

- C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

1.4 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal to the Architect sufficiently in advance of scheduled performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with other submittals and related activities that require sequential activity including:
 - a. Testing.
 - b. Purchasing.
 - c. Fabrication.
 - d. Delivery.

2. Coordinate transmittal of different types of submittals for the same element of the Work and different elements of related parts of the Work to avoid delay in processing because of the Architect's need to review submittals concurrently for coordination.
 - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are forthcoming.
 3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
 - a. Allow 2 weeks for the Architect's initial review of each submittal. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals. The Architect will advise the Contractor when a submittal being processed must be delayed for coordination.
 - b. Where necessary to provide an intermediate submittal, process the intermediate submittal in the same manner as the initial submittal.
 - c. Allow 2 weeks for reprocessing each submittal.
 - d. The Architect will not authorize an extension of time because of the Contractor's failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification.
1. Indicate name of the firm or entity that prepared each submittal on the label or title block.
 2. Provide a space approximately **4 by 5 inches** on the label or beside the title block to record the Contractor's review and approval markings and the action taken by the Architect.
 3. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of the Architect.
 - d. Name and address of the Contractor.
 - e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
 - j. Similar definitive information as necessary.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect and to other destinations by use of a transmittal form. The Architect will return submittals received from sources other than the Contractor.
1. Record relevant information and requests for data on the transmittal form. On the form, or an attached separate sheet, record deviations from requirements of the Contract Documents, including minor variations and limitations.
 2. Include the Contractor's certification stating that information submitted complies with requirements of the Contract Documents.

1.5 SHOP DRAWINGS

- A. Submit newly prepared information, drawn accurately to scale. Do not reproduce Contract Documents or copy standard printed information as the basis of Shop Drawings.
1. Include the following information on Shop Drawings:
 - a. Dimensions.
 - b. Identification of products and materials included.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 2. Submit Coordination Drawings where required for integration of different construction elements. Show construction sequences and relationships of separate components where necessary to avoid conflicts in utilization of the space available.
 3. Highlight, encircle, or otherwise indicate deviations from the Contract Documents on the Shop Drawings.
 4. Do not allow Shop Drawing copies that do not contain an appropriate final stamp or other marking indicating the action taken by the Architect to be used in construction.
 5. Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40.
 6. Initial Submittal: Submit 4 blue- or black-line prints for the Architect's review. The Architect will return a minimum of three prints of all shop drawings to the Contractor.
Record Submittal: Submit 2 approved blue- or black-line prints, for maintenance manuals.

1.6 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to the Project.
1. Where Product Data includes information on several similar products, some of which are not required for use on the Project, mark copies clearly to indicate which products are applicable.
 2. Where Product Data must be specially prepared for required products, materials, or systems because standard printed data are not suitable for use, submit as Shop Drawings not Product Data.
 3. Include the following information in Product Data:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.

- f. Notation of coordination requirements.
 4. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- B. Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options by the Architect is required.
- C. Submittals: Submit 5 copies of each required Product Data submittal. Submit 2 additional copies where copies are required for maintenance manuals at project completion. The Architect will retain one or two copies and will return the others marked with the action taken and corrections or modifications required.
1. Unless the Architect observes noncompliance with provisions of the Contract Documents, the submittal may serve as the final submittal.
- D. Distribution: Furnish copies of final Product Data submittal to the manufacturers, subcontractors, suppliers, fabricators, installers, governing authorities and others as required for performance of the construction activities. Show distribution on transmittal forms.
1. Do not proceed with installation of materials, products, and systems until a copy of Product Data applicable to the installation is in the Installer's possession.
 2. Do not permit use of unmarked copies of Product Data in connection with construction.

1.7 SAMPLES

- A. Submit full-size, fully fabricated Samples, cured and finished in the manner specified, and physically identical with the material or product proposed for use.
1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample where so indicated. Include the following information:
 - a. Generic description of the Sample.
 - b. Size limitations.
 - c. Sample source.
 - d. Product name or name of manufacturer.
 - e. Compliance with recognized standards.
 - f. Compliance with governing regulations.
 - g. Availability.
 - h. Delivery time.
 2. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented by a Sample, submit at least 3 multiple units that show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

- c. Refer to other Specification Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be in an undamaged condition at time of use. On the transmittal form, indicate such special requests about disposition of Sample submittals.
 - d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
- B. Preliminary Submittals: Where Samples are specified for selection of color, pattern, texture, or similar characteristics from a manufacturer's range of standard choices, submit a single, full set of available choices for the material or product.
 - 1. Preliminary submittals will be reviewed and returned with the Architect's marking indicating selection and other action taken.
- C. Submittals: Except for Samples intended to illustrate assembly details, workmanship, fabrication techniques, connections, operation, and other characteristics, submit 3 sets of Samples. One set will be returned marked with the action taken.
 - 1. Maintain sets of Samples, as returned by the Architect, at the Project Site, available for quality-control comparisons throughout the course of construction activity.
 - 2. Unless the Architect observes noncompliance with provisions of the Contract Documents, the submittal may serve as the final submittal.
 - 3. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- D. Distribution of Samples: Distribute additional sets of Samples to the subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for performance of the Work. Show distribution on transmittal forms.
- E. Field samples specified in individual Specification Sections are special types of Samples. Comply with Sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.8 QUALITY ASSURANCE SUBMITTALS

- A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
 - 1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.
- C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control."

1.9 ARCHITECT'S ACTION

- A. Except for submittals for the record or for information, where action and return of submittals is required, the Architect will review each submittal, mark to indicate the action taken, and return.
 - 1. Compliance with specified characteristics is the Contractor's responsibility and not considered part of the Architect's review and indication of action taken.

- B. Action Stamp: The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken.

PART 2 - PRODUCTS (Not Applicable)**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION

SECTION 01 37 00 - CONSTRUCTION SCHEDULE AND SCHEDULE OF VALUES

1.01 DESCRIPTION:

- A. Related Requirements Specified Elsewhere:
1. General Conditions
 2. Supplementary General Conditions
 3. Summary of Work: Section 01 01 00
 4. Contract Closeout: Section 01 70 00
- B. The General Contractor shall prepare and maintain a detailed construction schedule which shall show clearly the sequence of all construction work. This schedule shall be the Contractor's working schedule and shall be used to plan, organize, and execute the work, record and report actual performance and progress, and show how the Contractor plans to complete all remaining work as of the end of each Progress Report period. The schedule shall provide sufficient detail and clarity of form and technique so that the Contractor can plan, schedule, monitor, control, and report on the progress of his work. In addition, it shall provide the Owner with a tool to monitor and follow the progress for all phases of the work. This schedule, along with the accompanying Schedule of Values, will be the basis for all pay applications, time extensions or delays, liquidated damages and early completion bonus, if applicable.

1.02 REQUIREMENTS

- A. The schedule shall clearly indicate all Contract milestones and completion dates of each construction activity. In addition, it shall include activities for procurement, shop drawings, fabrication and delivery for all important material items. Owner furnished materials must be incorporated also. Each activity on the schedule shall be identified with a description of the work, and a duration, in calendar days, for the performance of the activity. Each activity will be restrained by an early start date and a late finish date. Each activity will be preceded by all other activities which must be accomplished prior to that activity. The critical path will be clearly identified on the diagram. The schedule shall be consistent with the dates specified in the Contract. Major milestones shall include, but are not limited to, the following:
- Site utilities completion
 - Building pad completion
 - Structure dry-in
 - Items as noted in 1.07 of this Section
 - Permanent power connection
 - HVAC start-up
 - Substantial Completion (C.O.)
- B. The General Contractor shall involve all major subcontractors in the development and implementation of the schedule. The Contractor shall submit one digital and printed copy of the schedule rough draft within two weeks after award of the Contract. The Architect will review and return the proposed schedule within two weeks. Within two weeks after the Architect's approval of the rough draft, the Contractor shall submit the

final schedule, which shall include the signature of the Contractor and all major subcontractors.

Failure to submit initial schedule as specified will delay approval of progress payment until required information is submitted and approved by Architect.

1.03 SCHEDULE OF VALUES

- A. In conjunction with the progress schedule, a Schedule of Values is to be submitted for approval as basis for the contractor's Application for Payment. Use Specification Table of Contents as basis of format for listing costs of work for Sections under Division 2-16. Itemize separate line items cost for work required by each Section, as well as:
 - 1. Performance and Payment Bonds
 - 2. Field supervision and layout
 - 3. Temporary facilities and controls.
- B. Line item costs shall include overhead and profit. Make sum of total costs of all items listed in Schedule equal to total Contract Sum. Submit digital Schedule of Values on 8 ½ x 11" format.

1.04 UPDATES

- A. The initial updating will take place during the first week after the approval of the Contractor's schedule. Subsequent updates shall be scheduled at the end of each month thereafter for the duration of the Project. A monthly meeting will be held with Architect, Project Manager and Superintendent to review the schedule for:
 - 1. Actual start and completion dates.
 - 2. Cost value of work in place.
 - 3. Activity percent completion.
 - 4. Revised logic of activities.
 - 5. Influence of change orders.The Contractor shall come to the updating meeting with the above data prepared in advance.
- B. The updated schedule shall be submitted along with the Contractor's Application for Payment and Schedule of Values within five calendar days after each update meeting. Any delay in submittal of this information may withhold approval of progress payment.
- C. As part of the updating process, the Contractor shall prepare a written Status Report, describing the physical progress during the period, plans for the next week, actions planned to correct any lost time and discussion of any potential delays/problems that could impact the project completion date stated in the Contract. These should be submitted to the Architect and copied to the Owner on a weekly basis. The Contractor also shall provide, in writing, a 30 day notice confirming the completion date of the Project in order for the Owner to coordinate opening activities.

1.05 REVISION/TIME EXTENSIONS

- A. When change orders or delays are experienced by the Contractor, and the Contractor requests an extension of time, the Contractor shall submit a written Time Impact Analysis illustrating the influence of each change or delay in the current contract schedule completion date. Each analysis shall demonstrate the estimated time impact based on the events of delay, the date the change was given to the Contractor, the status of construction at that point in time, and the event time computation of all activities effected by the change or delay.
- B. Each Time Impact Analysis shall be submitted in triplicate and with fifteen calendar days after a delay occurs. In cases where the Contractor does not submit a Time Impact Analysis for a specific change order or delay within the specified period of time, he will have waived his rights to any additional time and cost. Approval or rejection of each analysis by the Owner shall be made within fifteen calendar days after receipt, unless subsequent meetings and negotiations are necessary. In the event the Contractor does not agree with the decision of the Owner regarding the impact of a change or delay, it shall be resolved in accordance with the "Disputes" clause of the Contract.

1.06 CONSTRUCTION TIME/LIQUIDATED DAMAGES

Construction time is of the essence to this contract. **The Contractor is to achieve Substantial Completion within 240 calendar days after Notice to Proceed. The Owner will assess Liquidated Damages to the Contractor of \$200.00 per day for each day the project is not Substantially Complete by the above time.**

END OF SECTION

SECTION 01 50 00 - CONSTRUCTION REQUIREMENTS, FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.

1.3 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, fire department, and rescue squad rules.
 - 5. Environmental protection regulations.
- B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
 - 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility..
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."
 - 1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- (16-mm-) thick exterior plywood.

2.2 EQUIPMENT

- A. General: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- C. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- D. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Provide temporary electricity and sanitary service. Connect to existing water service. Where company provides only part of the service, provide the remainder with

matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

- B. Water Service: Connect to existing water source at Owner's expense.
- C. Temporary Electric Power Service: Provide temporary power service as required for the Contractor's use. Contractor shall be responsible for the cost of temporary power until Substantial Completion.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.
- B. Temporary Construction Trailer: General Contractor shall provide a construction trailer for the safekeeping of plans, shop drawings, documents and telecommunications devices as required. The trailer location shall be approved by the Owner and Architect.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- B. Construction Fence: Provide a 6' high temporary construction fence at the perimeter of the new building protecting the construction activities from the school students and staff. Gate access and location of fence shall be coordinated with the Owner and Architect before installation.

3.5 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal.

END OF SECTION

SECTION 01 70 00 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project record document submittal.
 - 3. Operation and maintenance manual submittal.
 - 4. Submittal of warranties.
 - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.
 - a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
 - 2. Advise the Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra stock, and similar items.

8. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
 9. Complete final cleanup requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred, exposed finishes.
- B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
 2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
 2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
 3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
 4. Submit consent of surety to final payment.
 5. Submit a final liquidated damages settlement statement.
 6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.
1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 2. If necessary, reinspection will be repeated.
- C. Reinspection Fees: Should the Architect perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
1. The Owner will deduct the amount of the determined compensation from the final payment due the Contractor.

1.5 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
 3. Note related change-order numbers where applicable.
 4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
 5. Red line markups shall be transferred to PDF's of the drawings and provided to the Architect on a USB flash drive with other Record Documents.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.
1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
 2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
 3. Note related record drawing information and Product Data.
 4. Red line markups shall be transferred to PDF's of the specifications and provided to the Architect on a USB flash drive with other Record Documents.
- D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.
1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
 2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
 3. Upon completion of markup, submit complete set of record Product Data to the Architect for the Owner's records.

- E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records.
- G. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 4-inch, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Provide two (2) sets of each. Mark appropriate identification on front and spine of each binder. Include the following types of information:
1. Emergency instructions.
 2. Spare parts list.
 3. Copies of warranties.
 4. Wiring diagrams.
 5. Recommended "turn-around" cycles.
 6. Inspection procedures.
 7. Shop Drawings and Product Data.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

- A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
1. Maintenance manuals.
 2. Record documents.
 3. Spare parts and materials.
 4. Tools.
 5. Lubricants.
 6. Identification systems.
 7. Control sequences.
 8. Hazards.
 9. Cleaning.
 10. Warranties and bonds.
 11. Maintenance agreements and similar continuing commitments.

- B. As part of instruction for operating equipment, demonstrate the following procedures:
 - 1. Startup.
 - 2. Shutdown.
 - 3. Emergency operations.
 - 4. Noise and vibration adjustments.
 - 5. Safety procedures.
 - 6. Economy and efficiency adjustments.
 - 7. Effective energy utilization.

3.3 PROJECT CLOSE-OUT PACKAGE

- A. The Contractor shall submit the following Close-Out Documents to the Designer as a single package:
 - 1. Project Data.
 - 2. Consent of Surety to release retainage and pay Contractor in full.
 - 3. Contractor's Affidavit of Payment of Debts and Claims (AIA Document G706).
 - 4. The final application for payment accompanied by a statement of accounting. The statement shall reflect all adjustments to the Contract Sum.
 - a. The original Contract Sum.
 - b. Additions and deductions resulting from:
 - Change Orders
 - Allowances
 - Unit Prices
 - Deductions for non-conforming work
 - Deductions for Liquidated Damages
 - Deductions for re-inspection payments
 - Other adjustments
 - c. Total Contract Sum as directed.
 - d. Previous Payments
 - e. Sum Remaining Due
- B. When the Designer has determined that the close-out submittal is complete and correct, he will prepare a Change Order, if necessary, reflecting the approved adjustments to the contract sum which were not previously made by Change Order.
- C. The Designer will submit to the Owner the Project Close-Out package and the signed final Change Order (if required) with a cover letter certifying that, to the best of his knowledge, the completion of the project is in compliance with the Contract Documents and the balance shown is due and payable.
- D. Close-Out Documents shall specify that; No Owner liability shall exist for payment of equipment, material or labor which has not been properly paid for by the Contractor.

3.3 FINAL CLEANING

- A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1 Section 01710 "Cleaning".
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - 2) Revise seven subparagraphs below to suit Project. Check for conflict or duplication with provisions in other Sections, particularly Divisions 15 and 16.
 - m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

- s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
- E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.
 - 1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. If the Owner does not want them, dispose of these materials as directed by the Owner.

END OF SECTION

SECTION 01 71 00 - CLEANING**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Related Requirements Specified Elsewhere:
 - 1. Summary of Work: Section 01010
 - 2. Cutting and Patching: Section 01045
 - 3. Construction Facilities and Temporary Controls: Section 01500
 - 4. Contract Close-Out: Section 01700

- B. Work includes: The work in this section is required of each contractor unless otherwise specified:
 - 1. Each contractor:
 - a. Maintain premises and adjacent properties free of waste, debris and rubbish caused by construction operations.
 - b. At completion of work, or at such other times as directed by the Architect, remove all waste, debris, rubbish, tools, equipment, machinery and surplus materials. Clean all sight-exposed surfaces; leave work clean and ready for occupancy.
 - 2. General Contractor:
 - a. In addition to the work specified under "Each Contractor", supervise and coordinate the cleaning operations of all contractors.
 - b. At completion of project, leave project clean and ready for occupancy.

1.2 SAFETY REQUIREMENTS

- A. Standards: Maintain project in accord with following safety and insurance standards:
 - 1. Occupation Safety and Health Administration (OSHA).

- B. Hazards Control:
 - 1. Store volatile wastes in covered metal containers and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.

- C. Conduct cleaning and disposal operations to comply with Federal, State and local anti-pollution laws.
 - 1. Rubbish and waste materials shall not be burned or buried on project site.
 - 2. Volatile wastes such as mineral spirits, oil or paint thinner shall not be disposed of into storm or sanitary drains.
 - 3. Wastes shall not be disposed of into streams and waterways.

1.3 SUBMITTALS

- A. Manufacturer's recommendations for specified cleaning products.
- B. Proposed cleaning products for products where manufacturer's recommendations are not specified.

PART 3 - EXECUTION

3.1 GENERAL

- A. Execute cleaning to ensure that building(s), grounds and public properties are maintained and free from accumulations of waste materials and rubbish.
- B. Wet down materials and rubbish to lay dust and to prevent blowing dust.
- C. Twice weekly, during progress of work, clean site and public properties and dispose of waste materials, debris and rubbish.
- D. Provide on-site transportable cart containers for collection of waste, materials, debris and rubbish as required.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.
- F. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART I - GENERAL

1.01 SCOPE

- A. This section covers formwork, rebars and all other materials, equipment and methods for mixing, placing, testing, finishing, curing, etc. all plain and reinforced, cast-in-place, normal weight concrete.
- B. All embedded items required by other trades under the General Construction Contract shall be set under this section.
- C. Items not included in the General Construction Contract shall be furnished and placed by the trade requiring these items to be embedded in concrete, but the General Contractor shall cooperate with these trades in order that they are afforded an opportunity to make their installations before concrete is placed.

1.02 RELATED WORK

- A. Concrete Curing & Finishing - Section 033051

1.03 REFERENCE STANDARDS FOR QUALITY ASSURANCE

- A. All work, testing and inspection shall be in accordance with the applicable sections, and references therein, of the Specifications and Standards of the following:
 - 1. Locally Adopted Building Code
 - 2. American Concrete Institute (ACI)
 - 3. Concrete Reinforcing Steel Institute (CRSI)
 - 4. American Society For Testing Materials (ASTM)
 - 5. PS-1-U.S. Product Standard for Softwood Plywood.
- B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

- A. Shop drawings for all form work where appropriate and requested.
- B. Shop drawings for placing of all reinforcing steel.
- C. A trial mix prepared by an independent testing laboratory for each class of concrete and for each size and gradation of aggregate proposed for the project. The preliminary mix design submittals shall contain the applicable information all components of the mix. After mix is established and approved, substitutions shall not be made. (See Paragraph 3.07 - TESTING)

PART II - PRODUCTS

2.01 FORMWORK

- A. Forms for surfaces which will be exposed to view shall be plywood, steel or lined forms meeting the architectural requirements of the project. Metal or fiberglass forms shall be used for joist and waffle slabs.
- B. Form ties shall be designed by the Contractor.
- C. Form releasing agent shall be non-staining "Form Oil" as manufactured by Texaco, Sinclair or Nox-Crete Form Coating.

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2.02 REINFORCING STEEL

- A. Bars shall be deformed billet-steel bars conforming to ASTM A 615. All bars should be grade 60. All bars shall be shop-fabricated and bent cold. Bars shall be free from defects and kinks and from bends not indicated on the Drawings or approved bending diagrams.
- B. Mesh reinforcement shall be electrically welded, plain wire fabric conforming to ASTM A 185. Wire shall be cold-drawn mild steel conforming to ASTM A 82.
- C. Tie wire shall be of black annealed steel, 16-gage minimum.
- D. Metal accessories per CRSI.

2.03 CONCRETE

- A. Cement shall be an American brand approved by the engineer, conforming to ASTM C-150, Type 1, unless another type is specified. For exposed surface one brand shall be used throughout.
- B. (NOTE: All concrete exposed to freezing and de-icing agents shall have a minimum of 564 pounds (6 bags) of cement per cubic yard with a maximum water/cement ratio of .49 lbs/lb and 5 percent entrained air.)
- C. Coarse aggregate shall be crushed stone or gravel having clean, hard durable uncoated particles sized within the limits of ASTM C-33, Table 2, Size No. 57.
- D. Fine aggregate shall be clean, hard, durable natural siliceous river sand with uncoated grains free from all organic material or other impurities meeting ASTM C-33. Manufactured sand shall not be used.
- E. Mixing water shall be clean, potable, free from oil, acids, salts, alkalies and injurious amounts of vegetable matter.
- F. ADMIXTURES:
 - 1. All exterior concrete shall have an air-entraining agent (ASTM C-260) equal to Masterbuilders MBVR to produce a plastic mix with 6% entrained air. It shall be included in the trial design mixes submitted to the Engineer for approval.
 - 2. All interior concrete shall have an air-entraining agent (ASTM C-260) equal to Masterbuilders MBVR to produce a plastic mix with 2% - 3% entrained air. It shall be included in the trial design mixes submitted to the Engineer for approval.
 - 3. No other admixture, including flyash, shall be used without the written permission of the Architect/Engineer.
- G. Curing materials per Section 033051.

2.04 JOINT FILLER

- A. Expansion joint filler shall be preformed resilient, non-extruding, non-bituminous, fiber type conforming to ASTM D-1751 or D-544.

2.05 WATER STOPS

- A. Flexible polyvinyl, 3/8" X 6" ribbed type with center bulb.

PART III - EXECUTION

3.01 FORMWORK

- A. Where applicable forms shall be placed according to approved shop drawings.

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- B. Erect forms to required dimensions and cross-sections, free of surface defects, tied, shored and braced to movement and leakage of mortar. Any defective formwork and/or defective concrete shall be removed at Contractor's expense.
- C. Metal and/or fiberglass pans that are bent, badly rusted, cracked or otherwise damaged shall not be used and shall be removed from the site.
- D. Provide forms for footings if soil or other conditions are such that earth trench forms are unsuitable. Omission of forms shall be approved by the Architect/Engineer.
- E. Construct forms so they can be removed readily without hammering or prying against the concrete.
- F. Provide box-outs, bulkheads with keys, cleanouts, expansion joint strips, and other related items and features.
- G. Chamfer all exposed outside corners unless otherwise instructed.
- H. Tolerances shall be within the limitations set forth in ACI 347.

3.02 FORM COATING

- A. Immediately before the placing of reinforcing, faces of all forms in contact with the concrete shall receive a thorough coating of the liquid form releasing agent specified, applied in compliance with the manufacturer's instructions. After oiling, any surplus oil on the form surfaces shall be removed.

3.03 REMOVAL OF FORMS

- A. No forms shall be removed without the approval of the Architect/Engineer. In general and under normal conditions the Architect/Engineer will approve removal of forms as follows:
 - 1. Concrete beams, slabs and other members which span between definite supports shall attain 70% of the specified 28-day strength before removal of the forms. Shores for cantilevered beams and slabs shall remain in place for at least an additional 21 days.
 - 2. Pan forms may be removed after three days if pans are designed for early removal. Soffit boards shall not be disturbed and shall not be removed for a minimum of eight days.
 - 3. Under ordinary weather conditions, wall forms, column forms, side of beam forms and other vertical forms for concrete which do not span between definite supports may be removed after two days.
 - 4. Forms for footings may be removed after 24 hours under ordinary weather conditions.
 - 5. When ambient air temperature falls below 45 degrees F during the curing period form removal shall take place based on job-cured test cylinder strength only.
 - 6. After removing forms, horizontal members shall be promptly re-shored at mid-span until the 28-day strength of concrete is attained. No floor shall be loaded in excess of live load for which designed unless adequate shores are placed beneath members supporting the concentration of load.
 - 7. Under no circumstances shall wood be buried in full or left in contact with earth. All wood formwork shall be removed unless noted or specified otherwise.
 - 8. Care shall be taken in the removal of the forms to avoid damage to concrete

SECTION 033000 - CAST-IN-PLACE CONCRETE

surfaces. Immediately after the forms are removed, all damaged or imperfect work shall be patched, or, if the work is severely damaged or unacceptable, it shall be rebuilt. Remove all fins from exposed concrete surfaces immediately on removal of forms.

9. Forms to be reused shall be thoroughly cleaned and repaired. Split, frayed, delaminated, or otherwise damaged forms shall not be used.

3.04 REINFORCING STEEL

- A. Shop fabricate from approved shop drawings. Bars shall not be heated for bending. Return all horizontal bars 2'-0" (or provide individual corner bars) at all corners and intersections in all concrete walls and footings. All bars marked continuous shall be lapped with a Class "B" tension splice, including at corners. Splices shall be located as shown in accordance with CRSI Standards. Provide diagonal corner bars at corners of all openings in slabs and walls. Use 2-#5 X 4'-0" each corner, each face. If embedment length is not available provide standard hook. General placement and bar coverage shall be in accordance with ACI 318.
- B. At job site store at least 12" above ground. Bars shall be free of foreign matter. A thin coating of orange rust resulting from short exposure will not be considered objectionable.
- C. Reinforcement which has been exposed for bonding with future work shall be protected from corrosion by heavy wrappings of burlap saturated with a bituminous material.
- D. Notify the Engineer at least 24 hours prior to scheduled pouring of concrete for inspection of reinforcing steel. No concrete shall be poured until reinforcement placement is approved. Such approval shall not relieve the Contractor of his responsibility for correctness and compliance with the Contract Documents.

3.05 PRODUCTION OF CONCRETE

- A. Concrete shall be produced in an approved central mixing plant in accordance with ASTM C-94.
- B. Unless otherwise called for on the drawings, concrete shall develop a compressive strength at 28 days, when tested in accordance with the applicable sections of ASTM, as follows:
 1. Interior floor slabs and footings - 3000 psi
 2. Walks, curbs, topping slabs and concrete exposed to the weather - 4000 psi.

3.06 PLACING OF CONCRETE

- A. Concrete shall be placed in compliance with the applicable sections of the ACI. Special attention shall be given to the requirements for slump, testing, curing, tolerances and placing during severe weather.
- B. Forms shall be free of ice, water, hardened concrete, and debris and items to be embedded shall be in position.
- C. Subgrades shall be sprinkled sufficiently to eliminate water loss from concrete. Concrete shall not be placed on frozen ground.
- D. Concrete shall be transported by methods to avoid segregation. Do not use vibrators to transport concrete in forms. Concrete shall be placed rapidly and continuously and as close to its final position as possible. If construction joints are required they shall be

SECTION 033000 - CAST-IN-PLACE CONCRETE

placed at a location causing the least effect on the structural integrity of the work.

- E. Concrete shall be consolidated by vibration, spading and rodding. Work concrete around reinforcement and embedded items.
- F. Provide a drainage system for all retaining walls that are a part of the structure.
- G. Coordinate all drawings for proper slope of floor to drains in toilets, showers and similar areas.

3.07 TESTING

- A. The verification and control of concrete mixes shall be the work of an independent testing laboratory. The selection of laboratory and cost of testing shall be paid for by the Owner unless other arrangements are made.

B. LABORATORY SERVICES

- 1. Test aggregates, cement and water for specification compliance. During construction, the Engineer may require field inspection, sampling, and testing of cement, aggregates, etc. testing laboratory in order to determine if the requirements of this specification section are being satisfied.
- 2. Prepare trial mix for each class of concrete, make and break test cylinders. A minimum of two cylinders shall be tested at 7-days and 28-days.
- 3. Make slump test and air content test at job site for each sample tested for compressive strength.

- C. Test cylinders shall be made and tested as follows:

One (1) set of five (5) cylinders shall be made for each fifty (50) cubic yards or fraction thereof for each class of concrete in each day's pour. Of each set of test cylinders, two (2) shall be broken at seven (7) days, two (2) shall be broken at 28-days, and one (1) held in reserve.

Test cylinders will normally be laboratory-cured. However, the Engineer may require tests on field-cured specimens to check the adequacy of curing operations.

- D. Reports on all tests conducted by the laboratory shall be rendered promptly and distributed as follows:

| | |
|---------------------|------------------|
| Architect | One - (1) copy |
| Contractor | Two - (2) copies |
| Structural Engineer | One - (1) copy |

Report of control cylinders for job placed concrete shall contain the following:

- 1. Time of batching
- 2. Time of sampling
- 3. Concrete and air temperatures
- 4. Slump
- 5. Other information furnished by the General Contractor

E. CONTRACTORS FUNCTION

- 1. Contractor shall advise testing agency in advance of operations to allow for assignment of testing personnel and shall provide reasonable labor and

SECTION 033000 - CAST-IN-PLACE CONCRETE

assistance in obtaining, handling and storing test samples at the site.

2. Contractor shall observe procedures of laboratory personnel molding and handling test specimens and if he observes any irregularities of procedures, he shall report them in writing to the Architect within 48-hours.
3. Contractor shall keep a daily log recording quantities of each class of concrete used, the area location of each quantity of concrete relating to its controlling cylinder and the slump of this concrete, and general weather conditions. The contractor shall furnish this information to the laboratory for inclusion in the test report. The Contractor shall obtain delivery tickets showing the class and strength of concrete, the size of coarse aggregate and the slump order. The Contractor shall identify these tickets relative to the area of placement of the concrete and shall retain them on file. He shall produce the tickets should the Architect/Engineer so request.

3.08 PRECAUTIONS

- A. Styrofoam shall not be used as joint filler.
- B. Manufactured sand shall not be used for fine aggregate.
- C. Severe weather concreting shall be in accordance with ACI-305 and ACI-306.
- D. Retempered concrete shall not be used.
- E. Defective Work - No materials or concrete which fail to conform to the requirements of this specification section shall be incorporated into the work.
- F. Water stops shall be continuous. Do not use lap joints.
- G. The placing of dowels after concrete is poured is prohibited. Bars partially embedded in concrete shall not be field-bent.
- H. Calcium chloride shall not be used.

3.09 CLEAN-UP

- A. After completion of work, remove from the site all excess materials and debris.

END OF SECTION

SECTION 033051 - CONCRETE CURING AND FINISHES

PART I - GENERAL

1.01 SCOPE

- A. Provide all materials, equipment, incidentals and labor for patching, finishing, curing and protecting from flowing water and mechanical injury the concrete specified.

1.02 RELATED WORK

- A. Cast-In-Place Concrete - Section 033000

1.03 REFERENCED STANDARDS FOR QUALITY ASSURANCE

- A. All work shall be in accordance with the applicable sections and references therein, of the Specifications and Standards of the following:
 - 1. American Concrete Institute (ACI)
 - 2. American Society For Testing Materials (ASTM)
- B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

- A. Product data on curing compounds.

PART II - PRODUCTS

2.01 WATER CURING

- A. Heavy burlap weighing at least 10 ounces per square yard.
- B. Clean river sand, ASTM C-33.
- C. Sawdust

2.02 MEMBRANE CURING

- A. Waterproof sheet material conforming to ASTM C-171, Standard Specification for Sheet Materials For Curing Concrete.

2.03 LIQUID CURING

- | | |
|-------------------------------|--------------------------------|
| 1. "Kure-N-Seal" | Sonneborn |
| 2. "Clear Bond" | Guardian Chemical |
| 3. "Clear Seal" | (A.C. Horn) Grace Construction |
| 4. "Eucocure" or Kurez E-100" | Euclid Chemical Co. |
| 5. "Clear Seal" | Lambert Corporation |
| 6. "Chem-Seal" | Hillyard Chemical Co. |
| 7. "Masterseal" | Master Builders |

PART III - EXECUTION

3.01 PATCHING OF CONCRETE

- A. Immediately after removing forms, all surfaces shall be inspected for defective work. Any concrete which is poorly formed, out of alignment or level, or shows a defective service, shall at the election of the Engineer, be removed from the job by the Contractor at the Contractor's expense. The engineer may grant permission to patch

SECTION 033051 - CONCRETE CURING AND FINISHES

or repair defective work; but such permission shall not be considered a waiver of the Engineer's right to require complete removal of the defective work, if in the Engineer's opinion, the patching or repairs do not satisfactorily restore the quality and appearance of the items in question.

- B. Where permitted by the Engineer, all honeycombs, voids, stone pockets, tie holes and other defective areas shall be patched as soon as practicable. Patching shall be done in accordance with the following procedure.
1. Defective areas shall be chipped away to a depth of at least 1" with the edges cut perpendicular to the surface.
 2. The area to be patched and space at least 6" wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar.
 3. A grout of equal parts of Portland Cement and sand, with sufficient water to produce a brushing consistency, shall be well brushed into the surface followed immediately by the patching mortar.
 4. The patch shall be made of the same materials and of approximately the same proportion as used for the concrete except that the coarse aggregate shall be omitted. The mortar shall not be richer than 1 part cement to 3 parts sand. The proportions of white and gray cements shall be determined by making a trial patch. The amount of mixing water used shall be the minimum consistent with the requirements of handling and placing. The mortar shall be retempered without the addition of water by allowing it to stand for one hour, during which time it shall be mixed with a trowel to prevent setting.
 5. The mortar shall be thoroughly compacted into place and screened off so as to leave the patch slightly higher than the surrounding surface. The patch shall then be left undisturbed for one to two hours to permit initial shrinkage before being finally finished.
 6. The patched areas shall be finished to match the adjoining surface. On exposed surfaces, where unlined forms have been used, the final finish shall be obtained by striking off the surface with a straight edge spanning the patch and held parallel to the form marks.
 7. Curing of the patched areas shall be in accordance with these specifications.
 8. Contractor's Option:
In lieu of mixing grout for patching, the Contractor may provide a PVC bonding agent recommended by the manufacturer for the use intended. Approved products and manufacturers:
 - a. "Dara Weld C" by W.R. Grace
 - b. "Weldcrete" by E.A. Larson
 - c. "Vinyl Hesive" by Nox-Crete

3.02 CONCRETE FLOORS

(All floors, tilt-up panels and slabs on grade)

- A. The surface of all concrete shall be worked with a wood float or by machine in a manner which will compact the concrete and produce a surface free of depressions or inequalities of any kind. Test for grade (or level) and correct as necessary by removing excess or adding and compacting additional concrete. After the concrete

SECTION 033051 - CONCRETE CURING AND FINISHES

has hardened sufficiently to prevent fine material from working to the top (when the sheen or shiny film of water on the surface has disappeared), the surface shall be finished in accordance with the applicable following paragraphs, but excessive working shall be avoided. Final finishing shall not be started until all surface water has disappeared. The drying of the surface moisture must proceed naturally and must not be hastened by sacking or dusting-on of dry sand and/or cement.

- B. At the end of the job, or just prior to application of permanent floor coverings, slabs shall be thoroughly cleaned and left in suitable condition for installation of permanent covering.
- C. Tolerances
 - 1. While still plastic, concrete surfaces shall be testing for surface irregularities with a 10' straightedge and the necessary corrections made. Allowable irregularities is 1/8" in 10', non-accumulating.
 - 2. Floor slab surfaces shall slope uniformly to floor drains as shown on the drawings.
- D. Monolithic finish for Slabs

All interior floor slabs shall have a steel trowel finish (except for floor slabs to receive ceramic tile). The steel troweling shall produce a smooth finished surface free of pin holes and other imperfections.
- E. Depressed slabs shall have a rough screed finish at levels indicated on the drawings.
- F. Broom finish shall be used for all interior stairs unless shown otherwise. Slabs and landings shall be troweled to a smooth, even surface and receive a light broom finish.

3.03 FINISHES ON FORMED CONCRETE SURFACES

- A. Common finish shall be confined to concrete surfaces which will be covered by other construction and which will not be visible. This finish shall be produced by filling smoothly all tie holes, honeycomb and other depressions, knocking off and evening-up burrs and form marks.

3.04 CURING AND SEALING COMPOUND APPLICATION

- A. Curing and sealing compound shall be applied as soon as the concrete has set sufficiently so as not to be marred by the application. Preparation of surfaces, quantities used, application procedures, and installation precautions shall be followed in strict compliance with the manufacturer's stated recommendations and directions as set forth on the package.
- B. Final curing shall continue for 7-days minimum.

END OF SECTION

SECTION 033100- CONCRETE ACCESSORIES

PART I - GENERAL

1.01 SUBMITTALS

Submit manufacturer's product data for all specified materials intended for use.

PART II - PRODUCTS

2.01 MATERIALS

- A. Filler strips for expansion joints: Non-extruded type cane fiber board impregnated with bituminous material, score 1/2" for the edge, 3/4" of the way through, for easy removal of top 1/2" of filler strip material, after concrete pour, or foam plastic with extruded high impact polystyrene removable caps.
- B. Vapor retarder: 10-mil thickness polyethylene film.
- C. Gravel base: #4 graded aggregate.
- D. Joint filler: ASTM D1850.
- E. Evaporation Retarder:
 - 1. Acceptable Products:
 - a. Eucobar by Euclid Chemical Company
 - b. Confilm by Master Builders
 - 2. Characteristics:
 - a. Compatible with curing agents.
 - b. Designed for use on liquid concrete, to prevent shrinkage cracking.
 - c. Spray application.
 - d. Capable of maintaining moisture content of concrete surface as necessary to cure properly without plastic shrinkage.
- F. Concrete sealers:
 - 1. Acceptable products:
 - a. Rez-Seal by Euclid Chemical Company
 - b. Equal products by Scofield or Pro-Crete will be acceptable.
 - 2. Characteristics:
 - a. Combination Sealer and Curing Compound
 - b. Acrylic Copolymer Composition
 - c. Clear color with glossy finish, non-yellowing.

PART III – EXECUTION

3.01 ACCESSORIES

Install concrete accessories at locations indicated in accord with manufacturer's recommendations, and as specified herein.

3.02 GRAVEL BASE

SECTION 033100- CONCRETE ACCESSORIES

Install under concrete slabs, unless noted otherwise, and as indicated on the drawings.

3.03 VAPOR RETARDER

- A. Install vapor retarder over compacted, clean subgrade material, free of debris and protrusions.
- B. Lay vapor retarder over interior building area to receive concrete slab; lap edges 6". Apply membrane in maximum widths. Lay membrane with seams perpendicular to and lapped in direction of pour. Turn edges of membrane up to within 2' of top of slab at intersection with vertical surfaces.
- C. Seal openings in vapor retarder around pipes and other protrusions with mastic. Fold at corners for form envelope.
- D. Protect vapor retarder from damage until concrete slab is in place. Repair damaged membrane with vapor retarder patch, 6 inches larger on all sides than the damaged area.

3.04 JOINTS

- A. Expansion joints:
 - 1. Install filler strips from bottom of slab to within ½" of finished floor. Fill top ½" full and level with joint filler.
 - 2. Locate against walls at perimeter of floors and around other protrusions through slabs.
- B. Control joints:
 - 1. Locate control joints in accord with industry standards and as shown on drawings.
 - 2. Joints shall be formed, sawn, or tooled. Joints subject to traffic (wheel or foot) shall be tooled.
 - 3. Minimum depth of joint shall be 1/4 the depth of the slab.

3.05 SEALERS

Apply sealer to all concrete floors not receiving an applied finish. Comply with manufacturers recommended application specifications.

END OF SECTION

SECTION 034113 PRECAST CONCRETE HOLLOW CORE PLANKS

PART I - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes structural precast concrete units, plant case, including the following:
 - 1. Hollow-core slab units.
 - 2. Long-span units.
 - 3. Structural framing units.
- B. Related Section: Division 3 Section Architectural precast Concrete - Plant Cast contains requirements that relate to this Section.

1.03 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer, fabricate, and install structural precast concrete units to withstand design loadings indicated within limits and under conditions required.
- B. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering structural precast concrete units by employing a qualified professional engineer to prepare design calculations, fire-resistance calculations, shop drawings, and other structural data.

1.04 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specifications Sections.
- B. Product data and instructions for manufactured materials and products.
- C. Shop drawings prepared by or under the supervision of a qualified professional engineer detailing fabrication and installation of precast concrete units. Indicate member dimensions and cross-sections; locations, sizes, and types of reinforcement, including special reinforcement; and lifting devices necessary for handling and erection.
 - 1. Indicate layout and dimensions, and identify each precast concrete unit corresponding to sequence and procedure of installation. Indicate welded connections by AWS standard symbols, detail loose, cast-in, and field hardware, inserts, connections, and joints, including accessories and construction at opening in precast units.
 - 2. Indicate locations and details of anchorage devices that are to be embedded in other construction. Furnish templates, if required, for accurate placement.
 - 3. For precast concrete units indicated to comply with design loadings or calculated fire-resistance requirements, include structural analysis data sealed and signed by the qualified professional engineer responsible for their preparation.
- D. Samples, approximately 36 by 36 by 2 inches (300 by 300 by 50 mm), to illustrate quality of finishes, colors, shapes and texture of exposed precast concrete units including spandrel and columns.

SECTION 034113 PRECAST CONCRETE HOLLOW CORE PLANKS

- E. Samples of bearing pads.
- F. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the Quality Assurance Article.
- G. Design mixes for each concrete mix. Submit revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- H. Material test reports from a qualified independent testing agency evidencing compliance with requirements of the following based on comprehensive testing of current materials:
 - 1. Concrete materials.
 - 2. Reinforcing materials.
 - 3. Prestressing strands.
 - 4. Admixtures.
 - 5. Bearing Pads.
- I. Material certificates in lieu of agency test reports, when permitted by Architect, signed by fabricator certifying that each material item complies with requirements.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed structural precast concrete units similar to those indicated for this Project and with a record of successful in-service performance as well as sufficient production capacity to produce required units without delaying the Work.
 - 1. Fabricator must participate in the Precast/Prestressed Concrete Institute's (PCI) Plant Certification Program and be designated a PCI Certified Plant for the following product group and category:
 - 2. Product Group and Category: Group C, Category C4.
- B. Professional Engineer Qualifications: A professional engineer legally authorized to practice in the jurisdiction where Project is located, licensed in the State of Tennessee, and experienced in providing engineering services of the kind indicated that have resulted in the installation and successful in-service performance of precast concrete units similar to this Project in material, design, and extent.
- C. PCI Design Standard: Comply with recommendations of PCI MNL-120 PCI Design Handbook-Precast and Prestressed Concrete: applicable to types of structural precast concrete units indicated.
- D. PCI Quality-Control Standard: Comply with requirements of PCI MNL-116 Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products, including manufacturing and testing procedures, quality-control recommendations, and camber and dimensional tolerances for types of units required.
- E. ACI Publications: Comply with the following ACI publications applicable to types of structural precast concrete units indicated:
 - 1. ACI 301 Specifications for Structural Concrete for Buildings.
 - 2. ACI 318 (ACI 318M) Building Code Requirements for Reinforced Concrete.

SECTION 034113 PRECAST CONCRETE HOLLOW CORE PLANKS

- F. Welding Standards: Comply with applicable provisions of AWS D1.1 Structural Welding Code-Steel and AWS D1.4 □Structural Welding Code-Reinforcing Steel.
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- G. Calculated Fire-Test-Response Characteristics: When fire-resistance-rated assemblies are indicated, provide structural precast concrete units whose calculated fire resistance has been determined according to ASTM E 119 and PCI MNL-124 Design for Fire Resistance of Precast Prestressed Concrete and is acceptable to authorities having jurisdiction.
- H. Fire-Test-Response Characteristics: Provide structural precast concrete units that comply with the following requirements:
 - 1. Fire-response test are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency includes UL or another agency that is acceptable to authorities have jurisdiction and performs testing and follow-up services.
 - 2. Fire-resistance-rated assemblies indicated are identical in materials and construction to those tested for fire resistance per ASTM E 119.
 - 3. Fire-resistance-rated assemblies are indicated by design designations listed in the UL Fire Resistance Directory or in the listings of another qualified testing and inspecting agency.
 - 4. Products are identified with appropriate marking of applicable testing and inspecting agency.
- I. Mockups: Prior to installing precast concrete units, construct mockups for each form of construction and finish required to verify selections made under sample submittals. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
 - 1. Locate mockups on site in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect one week in advance of the dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's acceptance of mockups before start of final unit of Work.
 - 5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. When directed, demolish and remove mockups for Project site.
 - b. Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.
- J. Product Options: The drawings indicate size, profiles, and dimensional requirements of precast concrete units and are based on the specific types of units indicated. Other fabricators precast concrete units with equal performance characteristics may be considered. Refer to Division 1 Section Substitutions.

SECTION 034113 PRECAST CONCRETE HOLLOW CORE PLANKS

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver precast concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so that markings are visible.
- B. Lift and support units only at designated lifting or supporting points as shown on final shop drawings.
- C. Deliver anchorage items that are to be embedded in other construction before starting such work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART II - PRODUCTS

2.01 DELIVERY, STORAGE, AND HANDLING

- A. Available Fabricators: Subject to compliance with requirements, fabricators offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Coreslab Structures, Inc. 770-471-1150
 - 2. Metromont Materials Corp. 404-953-0331
 - 3. Tindall Concrete Georgia, Inc. 404-366-6270

2.02 FORMWORK

- A. Forms: Provide forms and, where required, form facing materials of metal, plastic, wood, or another acceptable material that is nonreactive with concrete and will produce required finish surfaces.

2.03 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60 (ASTM A 615M, Grade 400), deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, Grade 60 (ASTM A706M, Grade 400).
- C. Galvanized Reinforcing Bars: ASTM A 767 (ASTM A 767M), Blass II, 2 oz./sq. Ft. (610 g/sq. m) zinc, hot-dip galvanized.
- D. Steel Wire: ASTM A 82, plain, cold drawn.
- E. Steel-Welded Wire Fabric: ASTM A 185, plain, cold drawn.
- F. Deformed-Steel-Welded Wire Fabric: ASTM A 497, cold drawn.
- G. Supports for Reinforcement: Provide supports for reinforcement, including bolster, chairs, spacers and other devices for spacing, supporting and fastening reinforcing, complying with CRSI recommendations.
 - 1. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are protected with plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.04 PRESTRESSING TENDONS

- A. Prestressing Strand: ASTM A 416, Grade 250 or 270, uncoated, 7-wire, low relaxation strand.

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2.05 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III.
 - 1. Use only one brand and type of throughout Project, unless otherwise acceptable to Architect.
- B. Fly ASH: ASTM C 618, Class C or F.
- C. Silica Fume: ASTM C 1240, amorphous silica.
- D. Normal-Weight Aggregates: ASTM C 33, Class 5S. Provide aggregates from a single source.
- E. Lightweight Aggregates: ASTM C 330.
- F. Water: Potable.
- G. Admixture, General: Provide admixtures for concrete that contain not more than 0.1 percent chloride ions by mass of portland cement or cementitious material.
- H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- I. Water-Reducing Admixture: ASTM C 44, Type A.
- J. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- K. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- L. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.06 CONNECTION MATERIALS AND FINISHES

- A. Steel Shapes and Plates: ASTM A 37 (ASTM A 36M).
- B. Malleable Iron Castings: ASTM A 47 (ASTM A 47M).
- C. Bolts and Studs: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washer.
- D. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
- E. Welded Headed Studs: AWS D1.1, Type B headed studs, cold-finished carbon-steel bars.
- F. Deformed-Steel Wire Bar Anchors: ASTM A 496.
- G. Welding Electrodes: Comply with AWS standards.
- H. Accessories: Provide clips, hangers, shims, and other accessories required to install precast concrete units.
- I. Hot-/dip Galvanized Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by the hot-dip process, complying with the following requirements:
 - 1. ASTM A 123 for galvanizing rolled, pressed, and forged shapes, plates, bars, and strips.
 - 2. STM A 153 for galvanizing iron and steel hardware.
- J. Galvanizing Repair Paint: High-Zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

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- K. Shop-Primed Finish: Prepare surfaces of interior steel items, except those with galvanized finish or those surfaces to be embedded in concrete, according to requirements of SSPC-SP 3 and shop-apply primer according to SSPC-PA 1.
 - 1. Primer: Fast-curing, lead- and chromate-free, VOC-conforming, universal modified-alkyd primer with good resistance to normal atmospheric corrosion complying with performance requirements of FS TT-P-664.

2.07 BEARING PADS

- A. Provide bearing pads for precast concrete units as follows:
 - 1. Elastomeric Pads: ASSHTO M 251, Plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 shore A durometer, minimum tensile strength 2250 psi (15.5 MPA) per ASTM D 412.
 - 2. Random, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 shore A durometer.
 - 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric, bonded in elastomer. Surface hardness of 80 to 100 shore A durometer.
 - 4. Frictionless Pads: Tetrafluoroethylene (TFE), glass-fiber-reinforced, bonded to mild-steel plate, of type required in-service stress.
 - 5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.08 GROUT MATERIALS

- A. Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2 □ parts sand, by volume, with minimum water required for placement and hydration.
- B. Metallic, Nonshrink Grout: premixed, factory-packaged ferrous aggregate grout, complying with ASTM C 1107, with fluid consistency and a 30-minute working time.
- C. Nonmetallic, Nonshrink Grout: premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sand, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and a 30-minute working time.

2.09 CURING MATERIALS

- A. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type I, Class B.
 - 1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.

2.10 CONCRETE MATERIALS

- A. Prepare design mixes for each type of concrete required.
 - 1. Limit use of fly ash and silica fume to not exceed, in aggregate, 25 percent of the portland cement by weight.
 - 2. Design mixes may be prepared by a qualified independent testing agency or by qualified precast manufacturing plant personnel at precast fabricator's option.

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3. Normal-Weight Concrete: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1 and ACI 301, using materials to be used on the Project, to provide normal-weight concrete with the following properties:
 - a. Compressive Strength (28-Day): 6000 psi (41.4 Mpa)
 - b. Compressive Strength (28-Day): 5000 psi (34.5 Mpa)
 - c. Compressive Strength (28-Day): 4000 psi (25.6 Mpa)
 - d. Maximum Water-Cement Ratio at Point of Placement: 0.40.
 - e. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.40.
4. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows, with a tolerance of plus or minus 1-1/2 percent:
 - a. Air Content: 6 percent for 1-inch (25-mm) maximum aggregate.
 - b. Air Content: 6 percent for 3/4-inch (10-mm) maximum aggregate.
 - c. Air Content: 7 percent for 1/2-inch (12-mm) maximum aggregate.
 - d. Air Content: 2.5 to .5 percent.
5. Lightweight Concrete: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.2 and ACI 301, using materials to be used on the Project, to provide lightweight concrete with the following properties:
 - a. Compressive Strength (28-Day): 6000 psi (41.4 Mpa).
 - b. Compressive Strength (28-Day): 5000 psi (34.5 Mpa).
 - c. Compressive Strength (28-Day): 4000 psi (27.6 MPa).
 - d. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft. (1842 kg/cu. m), according to ASTM C 567.
6. Add air-entraining admixture at manufacturer's prescribed rate to result in lightweight concrete at point of placement having an air content as follows:
 - a. Air Content: 4 to 6 percent for 3/4-inch (19-mm) maximum aggregate.
 - b. Air Content: 4.5 to 7.5 percent for 3/8-inch (10-mm) maximum aggregate.
 - c. Air Content: 4 percent, minimum.
7. Other Admixtures: Use water-reducing, high-range water-reducing, water-reducing and accelerating, or water-reducing and retarding admixtures according to manufacturer's directions.
8. Concrete-Mix Adjustments: Concrete mix design adjustments may be proposed when characteristics of materials, project conditions weather, test results, or other circumstances warrant.

2.11 FABRICATION

- A. Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and for pretensioning and detensioning operations. Maintain formwork to provide completed

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precast concrete units of shapes, line and dimension indicated, within fabrication tolerances specified in PCI MNL-116.

1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.
 2. Unless forms for precast, prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not induced in precast units due to deformation of concrete under prestress or movement during detensioning.
- B. Built-In Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect the position of the main reinforcement or placing of concrete. Do not relocate bearing plates in units, unless acceptable to Architect.
- C. Cast-in openings larger than 10 inches (250 mm) in diameter or 10 inches (250 mm) square according to final shop drawings. Other smaller holes may be field cut by trades requiring them, as acceptable to Architect.
- D. Reinforcement: Comply with the recommendations of CRSI's □ Manual of Standard Practice for fabricating, placing, and supporting reinforcement.
1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete.
 2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers and hangers, as required.
 3. Place reinforcement to obtain at least the minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces
 4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Pretensioning: pretension tendons for precast, prestressed concrete either by single-stand tensioning method or multiple-stand tensioning method. Comply with PCI MNL-1126 requirements.
- F. Concrete Mixing: Comply with requirements and with ASTM C 94. Following concrete batching, no additional water may be added.
- G. Concrete Placement: Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast units. Comply with requirements of ACI 304R for measuring, mixing, transporting, and placing concrete.
1. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with ACI 209R.
 2. Comply with ACI 306R procedures for cold-weather concrete placement.

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3. Comply with ACI 305R procedures for hot-weather concrete placement.
- H. Identify pickup points of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on final shop drawings. Imprint casting date on each precast unit on a surface that will not show in the finished structure.
- I. Cure concrete according to the requirements of PCI MNL-116 by moisture retention without heat or by accelerated heat curing, using low-pressure live steam or radiant heat and moisture.
- J. Delay detensioning prestressed concrete units until concrete has attained at least 70 percent of its compressive strength as established by test cylinders cured under the same conditions as the concrete.
 1. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
 2. Detension pretensioned tendons wither by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
- K. Finish formed surfaces of precast concrete as indicated for each type of unit, and as follows:
 1. Standard Finish: Normal plant-run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal color variations, and form joint marks, and minor chips and spalls will be tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.
 2. Grade A Finish: Fill air pockets and holes greater than 1/4 inch (6mm) in diameter with sand-cement paste matching color of precast concrete. Grind smooth form offsets or fins greater than 1/8 inch (3 mm). Float-apply a neat cement-paste coating to exposed surfaces. Rub dried paste coat with burlap to remove loose particles.
- L. Finish unformed surfaces by trowel, unless otherwise indicated. Consolidate concrete, bring to proper level with straightedge, float and trowel to a smooth, uniform finish.
 1. Apply scratch finish to precast concrete units that will receive concrete topping after installation. Following initial strike-off, transversely scarify surface to provide ridges approximately 1/4 inch (6 mm) deep.

2.12 HOLLOW CORE SLAB UNITS

- A. Type: Precast, prestressed concrete units with open, hollow cores running the full length of the slab units.
- B. Furnish units free of voids or honeycombs.
- C. Provide standard finish to precast units.
- D. Reinforce units to resist transportation and erection stresses.
- E. Include cast-in weld plates where required.
- F. Coordinate with other trades for installation of cast-in items.

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- G. Provide solid, monolithic, precast concrete slab units forming an integral part of the hollow-core slab unit system. Design and fabricate solid units to dimensions and details indicated as required for hollow-core slab units.
- H. Provide headers of cast-in-place concrete or structural steel shapes for openings larger than one slab width according to hollow-core slab unit fabricator's recommendations.

2.13 LONG-SPAN UNITS

- A. Type: Plant-fabricated, precast, prestressed concrete long-span units.
- B. Furnish units free of voids or honeycombs.
- C. Provide standard finish to precast units, unless otherwise indicated.
 - 1. Where designed as composite members, broom or rake top finish of precast concrete units for bonding with concrete floor topping.
 - 2. Where used as roof members, provide smooth, float top finish to precast concrete units.
- D. Where ends of strands will not be enclosed or covered, cut flush and cover with a high-strength mortar bonded to unit with an epoxy-resin bonding agent.
- E. Reinforce units to resist transportation and erection stresses.
- F. Include cast-in weld plates where required.
- G. Coordinate with other trades for installation of cast-in items.

2.14 STRUCTURAL FRAMING UNITS

- A. Type: Precast, prestressed concrete structural framing units.
- B. Furnish units free of voids or honeycombs.
- C. Provide Grade A finish to precast units.
- D. Where ends of stands will not be enclosed or covered, cut flush and cover with a high-strength mortar bonded to unit with an epoxy-resin bonding agent.
- E. Reinforce units to resist transportation and erection stresses.
- F. Include cast-in weld plates where required.
- G. Coordinate with other trades for installation of cast-in items.

2.15 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL-116 requirements.
- B. Strength of precast concrete units will be considered potentially deficient when precast concrete units fail to comply with requirements, including the following:
 - 1. Fail to meet compressive-strength test requirements.
 - 2. Reinforcement, and pretensioning and detensioning tendons of prestressed concrete do not conform to fabrication requirements.
 - 3. Concrete curing and protection of precast units against extremes in temperature fail to meet requirements.
 - 4. Precast units are damaged during handling and erecting.

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- C. Testing: When there is evidence that the strength of precast concrete units may be deficient or may not meet requirements, the Owner will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.
1. A minimum of 3 representative cores will be taken from precast concrete units of suspect strength, from locations directed by Architect.
 2. Cores will be tested, following immersion in water, in a wet condition per ACI 301 when precast concrete units will be wet under service conditions.
 3. Cores will be tested in an air-dry condition per ACI 301 when precast concrete units will be dry under service conditions.
 4. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is at least 85 percent of the 28-day design compressive strength and no core compressive strength is less than 75 percent of the 28-day design compressive strength.
 5. Test results will be made in writing on the same day that test are made, with copies to Architect, Contractor, and precast fabricator. Test reports will include the Project identification name and number, date, name of precast concrete unit or units represented by core test; design compressive strength, compressive strength at break and type of break, corrected for length-diameter ratio, and direction of applied load to core with respect to horizontal plane of concrete as placed.
- D. Patching: Where core test results are satisfactory and precast concrete units meet requirements, solidly fill core holes with patching mortar and finish to match adjacent concrete surfaces.
- E. Dimensional Tolerances: Units having dimensions smaller or greater than required and not meeting tolerance limits may be subject to additional testing.
1. Precast units having dimensions greater than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to meet construction conditions.
- F. Defective Work: Precast concrete units that do not conform to requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that meet requirements.

PART III - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements, including installation tolerances, true and level bearing surfaces, and other conditions affecting performance of precast concrete units. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Bearing Pads: Install bearing pads as precast concrete units are being erected. Set pads on true, level, and uniform bearing surfaces and maintain in correct position until precast units are placed.

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- B. Welding: Perform welding in compliance with AWS D1.1 and AWS S1.4, with qualified welders.
 - 1. Protect precast concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
 - 2. Repair damaged metal surfaces by cleaning and applying a coat of galvanizing repair paint to galvanized surfaces.
 - 3. Repair damaged metal surfaces by cleaning and repriming damaged painted surfaces.
- C. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed units, unless otherwise acceptable to Architect.
- D. Erection Tolerances: Install precast units level, plumb, square, and true, without exceeding the recommended erection tolerances of PCI MNL-127 □ Recommended Practice for Erection of Precast Concrete.
- E. Shore and brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.
- F. Grouting Connections and Joints: After precast concrete units have been placed and secured, fill open spaces at keyways, connections, and joints as follows:
 - 1. Grout Type: Cement grout.
 - 2. Grout Type: Metallic, nonshrink grout.
 - 3. Grout Type: Nonmetallic, nonshrink grout.
 - 4. Provide forms or other acceptable method to retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, plumb, and level with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

3.03 CLEANING

- A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.
 - 1. Wash and rinse according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

END OF SECTION

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Concrete unit masonry.
 - 2. Utility brick.
- B. Products installed but not furnished under this Section include the following:
 - 1. Steel lintels for unit masonry specified in Division 5 Section "Metal Fabrications."
 - 2. Steel shelf angles for unit masonry specified in Division 5 Section "Metal Fabrications."
 - 3. Wood nailers and blocking built into unit masonry specified in Division 6 Section "Rough Carpentry."
 - 4. Hollow metal frames in unit masonry openings specified in Division 8 Section "Standard Steel Doors and Frames."

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each different masonry unit, accessory, and other manufactured product specified.
- C. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.
- D. Samples for verification of the following:
 - 1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.

2. Colored-masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on the Project. Label samples to indicate type and amount of colorant used.
- E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to specifically identify exact materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor acceptance of mockup constitutes approval of deviations from Contract Documents unless such deviations are specifically brought to the attention of the Architect and approved in writing.
- F. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.
1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
 2. Each material and grade indicated for reinforcing bars.
 3. Each type and size of joint reinforcement.
 4. Each type and size of anchors, ties, and metal accessories.

1.4 QUALITY ASSURANCE

- A. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- B. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.
- C. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Mockup: Prior to installing unit masonry, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
1. Locate mockups on site in the locations indicated or, if not indicated, as directed by Architect.
 2. Build mockup of typical wall area as shown on Drawings.
 3. Build mockups for the following types of masonry in sizes approximately **48 inches (1200 mm)** long by **48 inches (1200 mm)** high by full thickness, including face and back-up wythes as well as accessories.

- a. Each type of exposed unit masonry construction.
- b. Typical exterior utility brick wall.
4. If mock-up panels do not conform to specifications or as directed by Architect, they will be rejected and rebuilt until they are accepted.
5. Clean exposed faces of mockups with masonry cleaner indicated.
6. Notify Architect one week in advance of the dates and times when mockups will be constructed.
7. Protect accepted mockups from the elements with weather-resistant membrane.
8. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - a. Acceptance of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - b. Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
 - c. When directed, demolish and remove mockups from Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of **24 inches (600 mm)** down both sides and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of **24 inches (600 mm)** down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:
1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:
 - a. 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C).
 - b. 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.
 - c. 25 to 20 deg F (-4 to -7 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C) if grouting. Use heat on both sides of walls under construction.
 - d. 20 deg F (-7 deg C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F (0 deg C) within the enclosures.
 2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:
 - a. 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.
 - b. 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi/h (25 km/h).

- c. 20 deg F (-7 deg C) and Below: Provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.
 3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.
 1. Provide special shapes for lintels, jambs, sash, control joints, headers, bonding, and other special conditions.
 2. Provide square-edged units for outside corners, except where indicated as bullnose.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:
 - a. 1900 psi (13.1 MPa).
 - b. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.
 2. Weight Classification: Lightweight.
 3. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on Drawings:
 - a. 4 inch (100 mm) nominal: 3-5/8 inch (92 mm) actual.
 - b. 6 inch (150 mm) nominal: 5-5/8 inch (143 mm) actual.
 - c. 8 inch (200 mm) nominal: 7-5/8 inch (194 mm) actual.
 - d. 12 inch (300 mm) nominal: 11-5/8 inch (295 mm) actual.
 - e. 16 inch (400 mm) nominal: 15-5/8 inch (397 mm) actual.
 4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.2 BRICK

- A. General: Provide shapes indicated and as follows:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. On Drawings, show details of special conditions and special shapes required.
 3. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Utility Brick: ASTM C 216, Grade SW, Type FBX.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **3000 psi (20.7 MPa)**.
 2. Initial Rate of Absorption: Less than **30 g/30 sq. in. (30 g/194 sq. cm)** per minute when tested per ASTM C 67.
 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 4. Size (Actual Dimensions): **3-5/8 inches (92 mm)** wide by **3-5/8 inches (92 mm)** high by **11-5/8 inches (295 mm)** long.

2.3 MORTAR AND GROUT MATERIALS

- A. Provide natural color or white cement as required to produce mortar color as indicated on Exterior Finish schedule. Use for both Brick masonry and Concrete Masonry on exterior face only. Mortar for all other areas to be natural portland cement color.
- B. Provide Type S mortar.

2.4 JOINT REINFORCEMENT

- A. General: Provide joint reinforcement formed from the following:
1. Galvanized carbon-steel wire, coating class as follows:
 - a. ASTM A 153, Class B-2, for both interior and exterior walls.
- B. For multiwythe masonry, provide type as follows:
1. Ladder-eye adjustable design with perpendicular cross rods spaced not more than **16 inches (407 mm)** o.c. Adjustable ties are to hook into the eyes and extend into the exterior wythe at 16" oc.

2.5 TIES AND ANCHORS, GENERAL

- A. Materials:
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least **5/8-inch (16-mm)** cover on outside face. Outer ends of wires are bent 90 degrees and extend **2 inches (50 mm)** parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than **4 inches (100 mm)** wide.
1. Wire: Fabricate from **3/16-inch- (4.8-mm-)** diameter, hot-dip galvanized steel wire.
- D. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped **1/4-inch- (6.4-mm-)** diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within **1 inch (25 mm)** of masonry face, made from **0.188-inch- (4.8-mm-)** diameter, hot-dip galvanized steel wire.
 3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from **0.053-inch- (1.3-mm-)** thick, steel sheet, galvanized after fabrication.

2.6 EMBEDDED FLASHING MATERIALS

- A. Copper Fabric Flashing: Flexible sheet flashing especially formulated from two layers of glass fabric laminated with a specially blended asphalt to a copper core:
1. Copper core: 3 ounces per SF.
 2. Application: Use where flashing is fully concealed in masonry.
- B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material:
 - 1. Neoprene.
 - 2. Extruded plastic
- B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
 - 1. Styrene-Butadiene Rubber Compound: ASTM D 2000, Designation M2AA-805.
 - 2. Polyvinyl Chloride: ASTM D 2287, General Purpose Grade, Type PVC-65406.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep Holes: Provide the following:
 - 1. Wicking Material: Material as indicated below, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity between wythes:
 - a. Fibrous glass rope.

2.8 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of ½-cup (0.14-L) dry measure tetrasodium polyphosphate and ½-cup (0.14-L) dry measure laundry detergent dissolved in 1 gal. (4 L) of water.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.
- F. Wetting of Brick: Wet brick prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in. (g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed $\frac{1}{4}$ inch in 10 feet (6 mm in 3 m), nor $\frac{3}{8}$ inch in 20 feet (10 mm in 6 m), nor $\frac{1}{2}$ inch in 40 feet (12 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed $\frac{1}{4}$ inch in 20 feet (6 mm in 6 m), nor $\frac{1}{2}$ inch in 40 feet (12 mm in 12 m) or more. For vertical alignment of head joints, do not exceed plus or minus $\frac{1}{4}$ inch in 10 feet (6 mm in 3 m), nor $\frac{1}{2}$ inch (12 mm) maximum.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed $\frac{1}{4}$ inch in 20 feet (6 mm in 6 m), nor $\frac{1}{2}$ inch in 40 feet (12 mm in 12 m) or more. For top surface of bearing walls, do not exceed $\frac{1}{8}$ inch (3 mm) in 10 feet (3 m), nor $\frac{1}{16}$ inch (1.5 mm) within width of a single unit.
- C. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus $\frac{1}{8}$ inch (3 mm), with a maximum thickness limited to $\frac{1}{2}$ inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than $\frac{1}{8}$ inch (3 mm). Do not vary from head-joint thickness indicated by more than plus or minus $\frac{1}{8}$ inch (3 mm). Do not vary head-joint thickness from

adjacent head-joint thickness by more than $1/8$ inch (3 mm). Do not vary from collar-joint thickness indicated by more than minus $1/4$ inch (6 mm) or plus $3/8$ inch (10 mm).

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.
- B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
 - 1. One-half running bond with vertical joint in each course centered on units in courses above and below, unless indicated otherwise.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back $1/2$ -unit length for one-half running bond or $1/3$ -unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.
- E. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
 - 1. At exterior frames, insert extruded polystyrene board insulation around perimeter of frame in thickness indicated, but not less than $3/4$ inch (19 mm) to act as a thermal break between frame and masonry.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Where indicated on drawings, build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:
 - 1. Install compressible filler in joint between top of partition and underside of structure above.

2. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
 1. With full mortar coverage on horizontal and vertical face shells.
 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
 4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch (10-mm) joints.
- B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.
 1. At cavity walls, slope beds toward cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of brick.

3.6 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY

- A. Use continuous horizontal-joint reinforcement installed in horizontal mortar joints for bond tie between wythes.
- B. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
 1. Provide continuity with horizontal-joint reinforcement by using prefabricated "T" units.

3.7 CAVITIES

- A. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
 1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.
- B. Tie exterior wythe to back-up with continuous ladder-eye type horizontal-joint reinforcing.

3.9 HORIZONTAL-JOINT REINFORCEMENT

- A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of **5/8 inch (16 mm)** on exterior side of walls, **1/2 inch (13 mm)** elsewhere. Lap reinforcing a minimum of **6 inches (150 mm)**.
 - 1. Space reinforcement not more than **16 inches (406 mm)** o.c.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated “L” and “T” sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.10 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Provide an open space not less than **1 inch (25 mm)** in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
 - 2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than **24 inches (610 mm)** o.c. vertically and **36 inches (915 mm)** o.c. horizontally.

3.11 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Build-in horizontal pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section “Joint Sealants.”
 - 1. Locate horizontal pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.12 LINTELS

- A. Install steel lintels where indicated.

- B. Provide masonry lintels where shown and where openings of more than **12 inches (305 mm)** for brick size units and **24 inches (610 mm)** for block size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of **8 inches (200 mm)** at each jamb, unless otherwise indicated.

3.13 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.
- C. Install flashing as follows:
 - 1. At masonry-veneer walls, extend flashing from exterior face of veneer, through the veneer, up face of insulation at least **8 inches (200 mm)**, and into concrete masonry unit joint.
 - 3. At lintels and shelf angles, extend flashing a minimum of **4 inches (100 mm)** into masonry at each end. At heads and sills, extend flashing **4 inches (100 mm)** at ends and turn up not less than **2 inches (50 mm)** to form a pan.
 - 4. Interlock end joints of ribbed sheet-metal flashing by overlapping ribs not less than **1-1/2 inches (38 mm)** or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements of Division 7 Section "Joint Sealants" for application indicated.
 - 5. Extend sheet-metal flashing **½ inch (13 mm)** beyond face of masonry at exterior and turn down to form a drip.
 - 6. Cut off flashing flush with face of wall after masonry wall construction is completed.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
 - 1. Form weep holes with product specified in Part 2 of this Section.
 - 2. Space weep holes **24 inches (600 mm)** o.c.
- E. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
- F. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.14 INSTALLATION OF REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
1. Do not exceed the following pour heights for fine grout:
 - a. For minimum widths of grout spaces of $\frac{3}{4}$ inch (19 mm) or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches (38 by 51 mm), pour height of 12 inches (305 mm).
 - b. For minimum widths of grout spaces of 2 inches (51 mm) or for minimum grout space of hollow unit cells of 2 by 3 inches (51 by 76 mm), pour height of 60 inches (1524 mm).
 - c. For minimum widths of grout spaces of 2-1/2 inches (63 mm) or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches (63 by 76 mm), pour height of 12 feet (3.6 m).
 - d. For minimum widths of grout spaces of 3 inches (76 mm) or for minimum grout space of hollow unit cells of 3 by 3 inches (76 by 76 mm), pour height of 24 feet (7.3 m).
 2. Do not exceed the following pour heights for coarse grout:
 - a. For minimum widths of grout spaces of 1-1/2 inches (38 mm) or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches (38 by 76 mm), pour height of 12 inches (305 mm).
 - b. For minimum widths of grout spaces of 2 inches (51 mm) or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches (63 by 76 mm), pour height of 60 inches (1524 mm).
 - c. For minimum widths of grout spaces of 2-1/2 inches (63 mm) or for minimum grout space of hollow unit cells of 3 by 3 inches (76 by 76 mm), pour height of 12 feet (3.6 m).
 - d. For minimum widths of grout spaces of 3 inches (76 mm) or for minimum grout space of hollow unit cells of 3 by 4 inches (76 by 101 mm), pour height of 24 feet (7.3 m).
 3. Provide cleanout holes at least 3 inches (76 mm) in least dimension for grout pours over 60 inches (1524 mm) in height.
 - a. Provide cleanout holes at each vertical reinforcing bar.

- b. At solid grouted masonry, provide cleanout holes at not more than 32 inches (813 mm) o.c.

3.15 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 - 4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - 5. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using the following masonry cleaner:
 - a. Job-mixed detergent solution.
 - b. Proprietary acidic cleaner, applied in compliance with directions of acidic cleaner manufacturer.
 - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.
 - 7. Clean limestone units to comply with recommendations in the "Indiana Limestone Handbook" of the Indiana Limestone Institute of America.
- E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.16 MASONRY WASTE DISPOSAL

- A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the Project site for his use.
- B. Excess Masonry Waste: Remove excess, clean masonry, as described above, and other masonry waste and legally dispose of off Owner's property.

END OF SECTION

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART I - GENERAL

1.01 SCOPE

- A. This section covers all items fabricated from metal shapes, plates, rods and bars except component parts of equipment and items covered by other sections.
- B. Fabricated metal items, which are detailed on the drawings but not mentioned specifically herein, shall be fabricated in accordance with the applicable requirements of this section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Steel Joists Framing - Section 052100
- B. Steel Decking - Section 053100

1.03 REFERENCED STANDARDS FOR QUALITY ASSURANCE

- A. All work shall be in accordance with the applicable sections, and references therein, of the Specifications and Standards of the following:
 - 1. Manual of Steel Construction by American Institute of Steel Construction (AISC).
 - 2. American Society of Testing Materials (ASTM)
 - 3. American Welding Society (AWS)
 - 4. Steel Structures Painting Council (SSPC)
 - 5. Welded Steel Tube Institute (WSTI)
- B. In conflicts between this specification, industry standards and/or local building codes, the more stringent requirements shall govern.

1.04 SUBMITTALS

- A. Shop drawings in accordance with project procedures showing all dimensions, locations, connection details, notes, accessories, and other materials related to the furnishing, fabricating, testing, painting and erection of the structural steel required by these specifications.
- B. Shop drawings shall show complete bolting and welding information, both shop and field, using appropriate symbols.
- C. Shop drawings shall not be made by reproduction of design drawings. Steel erection drawings and detail sheets prepared by steel fabricator shall all be of the same size sheets and approximately the size of the design drawings.
- D. Shop drawings shall be reviewed for conformance to specific project requirements by the contractor before being submitted to the Engineer for approval.

1.05 QUALITY ASSURANCE

- A. All fabricators shall participate in the AISC Quality Certification Program and shall be designated as an AISC-Certified Plant.

PART II - PRODUCTS

2.01 MAIN, SECONDARY MEMBERS & BASE PLATES

- A. Rolled Sections - ASTM A-992, $F_y=50$ ksi.
- B. Steel Pipe - ASTM A-501, $F_y=36$ ksi.

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- C. Tube Sections - ASTM A-500, Grade "B", $F_y=46$ ksi or Grade "C", $F_y=50$ ksi.

2.02 BOLTS

- A. Bolted shop and field connections shall be made with high strength components conforming to ASTM A-325 or A-490. Bolts shall have an identifying mark of three (3) radial lines.
- B. Non-friction bolt connections may be with bolts conforming to ASTM A-307.
- C. All bolts shall be 3/4" diameter unless otherwise shown on drawings.

2.03 WELDING ELECTRODES

- A. All welding electrodes shall be E-70 series.

2.04 PAINT – EXPOSED STEEL ONLY

- A. Exposed steel is defined as steel exposed to view and/or weather.
- B. Unless otherwise noted shop coat paint may be fabricator's standard but shall be compatible with final field painting. Touch-up paint used in the field shall be the same type paint used for the shop coat and shall be delivered to the job in sealed containers clearly marked with manufacturer's name and brand.
- C. Finish paint shall be as specified elsewhere in this specification.
- D. Lintels shall receive two coats of shop paint before placing.

2.05 GROUT

- A. Grout for base plates shall be a ready-to-use, non-metallic, non-corrosive product requiring only addition of water at job site to produce a flowable grouting material having no drying shrinkage at any age. Compressive strength of grout shall be not less than 5000 psi at 28 days.

PART III - EXECUTION

3.01 FABRICATION

- A. Fabricate from approved shop drawings using members cut from full-length stock. Members may be spliced only where shown.
- B. Members shall be free from twist, bends, buckles or open joints.
- C. Shop connections may be bolted or welded. Welds, bolt size, number and spacing shall be determined by the AISC Standards. Fabricator shall design and be responsible for all connections. Connections for beams which cannot conform to the typical connection details shall be in accordance with the following:
 - 1. Where beam reactions are not shown on the drawings connection details shall be detailed for the end reaction resulting from the maximum uniform load which the beam will support (as simple beam) for the span on the drawing.
 - 2. Where beam reactions are shown on the drawings, the connections shall develop the reactions shown.
 - 3. Where connections are subject to eccentricity, such eccentricity shall be taken into account when detailing the connections.
- D. Bearing surfaces shall be planed to true beds. Abutting surfaces shall be closely fitted.

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Tubular sections shall be completely seal-welded at all joints, seams, and splices.

- E. Structural steel shall be provided with all holes for attaching wood, masonry, furring, sash angle clips and other parts.
- F. Fascia beams and other steel requiring accurate alignment shall be provided with slotted holes and/or washers for aligning the steel accurately. No erection bolts or other fastening parts or joints or rolled stamping names shall show on finished surfaces of exposed steel, exterior or interior.
- G. Lintels shall have 8" minimum bearing each side of opening.
- H. Shop connections may be welded except as noted. Field connections shall be welded or made with the high strength steel bolts except for girts, stair stringers and handrails which may be field bolted with machine bolts. All welding shall be done by operators qualified by AWS Standards. Certificate shall be furnished when requested. Welding techniques, appearance and quality shall conform to AWS Standards. Continuous jet welding may be employed at all exposed connections requiring a smooth weld in lieu of conventional welds that require grinding.

3.02 SHOP PAINT – EXPOSED STEEL ONLY

- A. Exposed steel is defined as steel exposed to view and/or weather.
- B. Exposed steel shall be shop cleaned per SSPC-SP3 and primer paint applied immediately thereafter. Except for steel to be field welded, surfaces shall be covered evenly and thoroughly and worked into joints. Paint shall be applied to dry surfaces. Parts inaccessible after assembly shall be given two (2) coats of the specified shop paint.
- C. Shop primer shall have a minimum dry film thickness of 1.2 mils.
- D. Contact surfaces shall be cleaned before assembly but shall not be painted. Machine finished surfaces shall be protected against corrosion by a suitable coating.

3.03 STORAGE OF MATERIAL

- A. Site storage of all structural steel shall be as directed by the job superintendent.
- B. All steel shall be stored on blocking so that no metal touches the ground and will be protected against bending under its own weight and water will not collect thereon.

3.04 ERECTION

- A. Steel shall be erected level and plumb within AISC tolerances. No final bolting or welding shall be done until structure is properly aligned. The structure shall be secured against all dead load, wind and erection stresses. Temporary bracing shall be used where necessary and shall remain in place as long as required for safety.
- B. Bolting shall be done with high strength friction type bolts and hardened washers. Set high strength bolts by the turn-of-the-nut method as specified by the "Research Council On Riveted and Bolted Structural Joints".
- C. Holes for turned bolts to be inserted in the field shall be reamed in the field. Erection bolts are not to be used on exposed surfaces. Erection bolts or other surfaces and stiffeners shall not interfere with architectural clearances.
- D. No additional holes or cutting of steel work other than shown on the Drawings shall be done without the written permission and approval of the Owner's representative.
- E. Light drifting necessary to draw the holes together will be permitted, but drifting to

SECTION 051200 - STRUCTURAL STEEL FRAMING

match unfair holes will not be allowed. Twist drills shall be used to enlarge holes as necessary to make connections. Reaming that weakens the members or makes it impossible to fill the holes properly or to adjust accurately after reaming will not be allowed. Enlarging holes by burning is prohibited.

- F. Welding - See Paragraph 3.01 H - Protect all adjacent finished surfaces during the progress of welding. Damaged surfaces shall be replaced at cost of the erection contractor.

3.05 FIELD PAINTING (TOUCH-UP)

- A. After the structural steel has been erected and before any superimposed construction is placed, apply one field coat of paint to all places where the shop coat of paint has rubbed away; where the shop coat of paint was omitted because of field welding, or where field welding has damaged the shop coat of paint. Apply field paint to the structural steel and bar joists before roof deck is applied.
- B. Touch-Up Paint - After erection is completed, all field bolts, field welds, abrasions, etc. shall be cleaned and spot painted. Paint shall be same material used for the shop coat and shall be applied evenly with no runs, etc.

3.06 FIELD QUALITY CONTROL

- A. The steel contractor shall secure the services of a testing laboratory as approved and accepted by the local authorities and the owner/engineer to provide qualified inspectors for the following inspections.
 - 1. All shop and field connections
 - 2. Qualifications of welders
 - 3. Daily calibration of impact wrenches used for high strength bolting
 - 4. Visual inspection of all work after erection
- B. Testing agency shall interpret tests and state in each report whether test specimens comply with requirements and specifically state any deviations therefrom.
- C. Costs of all inspections shall be paid for by the steel contractor. Testing laboratory shall send reports of all inspections directly to the engineer and owner and elsewhere as directed.
- D. Bolted connections shall be tested for minimum fastener tension for bolt size and grade specified in conformance with the AISC. Inspection for tightness shall be the arbitration method thus:
 - 1. Ten percent (10%) of all bolted connections, but not less than two (2) bolts (selected at random) in each connection shall be tested. Test shall be made with an "inspecting wrench" adjusted to "job inspection torque". If no nut or bolt head is turned, the connection shall be accepted. If any nut or bolt head is turned, all bolts and nuts in the entire connection shall be tested. Contractor shall tighten all bolts in any connection in which a test bolt failed and resubmit the connection for re-inspection. All costs for re-tightening of bolts shall be borne by this Contractor.
- E. Welded connections may be inspected visually unless otherwise noted on contract drawings. However if any weld appears inadequate the engineer can require magnetic particle or ultrasonic testing without any additional cost to owner.

3.07 CLEAN-UP

SECTION 051200 - STRUCTURAL STEEL FRAMING

After the completion of this work, remove from the site all excess materials and debris. Leave entire work in a neat and orderly condition ready for inspection.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood furring, grounds, nailers, and blocking.
 - 2. Plywood sheathing.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's (ALSC) Board of Review.
- C. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
 - 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
 - 3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and the requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.
- D. Warranty of chemical treatment manufacturer for each type of treatment.

1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood product from one source and by a single manufacturer.
- B. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire- retardant-treated wood product from one source and by a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
 - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

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. Wood-Preservative-Treated Materials:
 - a. Baxter: J. H. Baxter Co.
 - b. Chemical Specialties, Inc.
 - c. Continental Wood Preservers, Inc.
 - d. Hickson Corp.
 - e. Hoover Treated Wood Products, Inc.
 - f. Koppers Performance Chemicals

2.2 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. NELMA - Northeastern Lumber Manufacturers Association.
 - 2. NLGA - National Lumber Grades Authority (Canadian).
 - 3. RIS - Redwood Inspection Service.
 - 4. SPIB - Southern Pine Inspection Bureau.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and

identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

- D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
 - 1. Do not use chemicals containing chromium or arsenic.
 - 2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: For dimension lumber sizes, provide No. 2 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 2 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.5 STRUCTURAL-USE PANELS FOR BACKING

- A. Plywood Backing Panels: For mounting electrical, communication, or telephone equipment, provide plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch thick.

2.6 PLYWOOD SHEATHING

- A. General: Where structural-use panels are indicated for concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).
 - 1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
 - 2. Span Ratings: 32/16.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

- D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- F. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.
- G. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.3 INSTALLATION OF PLYWOOD

- A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
 - 1. Comply with "Code Plus" provisions of above-referenced guide.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Roof sheathing:
 - a. Screw to lightgage metal framing.
 - b. Space panels **1/8 inch (3 mm)** apart at edges and ends.
 - 2. Plywood Backing Panels: Screw to supports.

END OF SECTION

SECTION 07 11 50 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cold-applied, cut-back asphalt dampproofing.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 BITUMINOUS DAMPPROOFING

- A. Cold-Applied, Cut-Back (Solvent-Based) Asphalt Dampproofing:
 - 1. Trowel Coats: ASTM D 4586, Type I.
 - 2. Brush and Spray Coats: ASTM D 4479, Type I.
 - 3. Manufacturers:
 - a. Gardner Asphalt Corporation.
 - b. Henry Company.
 - c. Karnak Corporation.
 - d. Koppers Industries, Inc.
 - e. Malarkey Roofing Company.
 - f. Meadows, W. R., Inc.
 - g. Sonneborn, Div. of ChemRex, Inc.
 - h. Tamms Industries.

2.3 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

- A. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.
- B. Apply dampproofing to footings and foundation walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
 - 1. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.
- C. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

3.2 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

- A. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft..

END OF SECTION

SECTION 07 20 00–METAL BUILDING INSULATION SYSTEMS

Part I: General

1.1 Work Included:

- A. Interior liner fabric of the color specified, support strapping of the appropriate color, fasteners of the appropriate type and color, sealants, thermal break materials and thermal insulation of the appropriate type to insulate the roof and wall areas to the full designed 'R' value of the building as specified. The installed liner system shall be capable of providing fall protection to insulators and other roof workers.

1.2 Quality Assurance:

- A. Provide the materials in original manufacturer's packages together with detailed instructions and project drawings of the installation. Materials shall be inspected for damage, proper sizes and quantities upon delivery and stored in a dry, secure manner. Installation shall proceed with care to assure proper sealing of the liner fabric. Insulation shall be placed on (ceiling) or behind (walls) the liner fabric in the full-specified thickness without voids or compression. Notify Thermal Design (800-255-0776) immediately of any damages, improper sizes or shortages. No changes or substitutions will be allowed unless submitted at least 10 days prior to bid date. Substitutions of systems that do not have a continuous vapor barrier on the inside plane of the purlins or girts will not be allowed. Purlins, girts and insulation must be completely isolated from the inside conditioned air with an effective vapor barrier. Taping or stapling of vapor barrier lap joints is not acceptable. Sealing field joints with a permanent vapor barrier lap sealant is required. Field seams, if any, shall be made on a structural member and mechanically attached with a metal band and fasteners along its full length.
- B. All exposed parts of the system shall have flame spread of 25 or less and smoke developed value of 50 or less based on ASTM E-84 standards. Vapor barrier fabric shall be opaque white or colored woven reinforced polyethylene with extrusion-welded seams fabricated in one piece, to fit not less than the full bay length by the width of the building. Buildings more than 100' wide may have field seams on the bottom of a purlin but no less than 50' apart. Any field seams must be sealed with vapor barrier lap sealant. Wall bay minimum fabric size shall be not less than one entire wall bay or end wall column space from ceiling to floor. Perimeter edges of the vapor barrier fabric shall be trimmed and sealed to the adjoining steel or fabric with vapor barrier lap sealant. All edges of liner fabric including field seams shall be mechanically fastened with steel retaining straps the full perimeter. In the event that the crew is not experienced in the installation procedures, video taped or on-site installation training shall be requested by the installing contractor from the system manufacturer to assure proper installation procedures; additional charges may apply.

1.3 Submittals:

- A. Include manufacturer's product brochures; component specifications of the reinforced polyethylene vapor barrier fabric including a sample of a typical seam; specific detailed drawings from the manufacturer for the project showing purlin spacings, support strap spacings, liner fabric sizes and locations; insulation thicknesses, sizes and locations and detailed installation instructions.

1.4 Fall Protection Clause:

- A. Provide detailed installation instructions to assure proper installation and function as an alternative form of fall protection in metal building structures. Perimeter edge protection is still required for topside workers. U.S. Patents #4446664, #4573298, #5901518, and #5953875 cover Thermal Design insulation systems methods and structures.

Part II: Products

2.1 Acceptable system or substitutions by Prebid approval only

- A. The Simple Saver insulation system manufactured by Thermal Design, PO Box 468, Madison, NE 68748, 1-800-255-0776, www.thermaldesign.com, with an installed total roof insulation 'R' value of 30 and an average installed thickness of 12 inches. Roof system shall be a double layer system. A thermal break shall be applied or a thermal block shall be applied where there is no existing thermal break between metal panel and metal structure. The thermal break shall be 3/8" Snap-R™ thermal block. The installed total insulation 'R' value of wall insulation shall be R-25 and an average installed thickness of 8 inches. System components shall meet the following minimum specifications:
- B. Steel Strap: 100,000 psi yield high tensile strength steel, galvanized, primed and then painted the specified color on the exposed side. Minimum size shall be 0.02 x 1" x continuous length. The strap color shall be: White.
- C. Fasteners: #12 X 3/4", plated self-drilling screws with sealing washers painted to match the specified color for fastening to light gauge steel (up to 12 GA purlins), # 12 X 1 1/4" plated self-drilling screws with sealing washers, painted to match the specified color for heavier gauge steel (up to 3/8" purlins/bar joist). Special fasteners for wood, concrete and other structure types are available from Thermal Design and should be used when appropriate.
- D. Simple Saver System Liner Fabric: Shall be woven reinforced high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene film. The fabric grade for the ceiling shall be: Super White. The fabric shall have a flame-spread index of 25 or less and smoke density index of 50 or less based on ASTM E-84 test standards. This material shall be manufactured in large custom pieces by extrusion welding from roll goods. Pieces shall be fabricated to substantially fit the large defined building areas with minimum practical sealing to be done on job site. Fabric shall be folded to allow for rapid pullout on the strap support system. Color for ceiling fabric shall be White; color for walls shall be White.
- E. Liner fabric perm rating shall be (select one): 0.025 grains per hour per sq feet based on ASTM E-96, procedure B or liner fabric shall not function as a vapor barrier but shall be perforated with 3/16 minimum holes space not more than 4 inches apart in each direction.
- F. Sealants: Shall be Simple Saver System G524 high tack solvent-based vapor barrier sealant for sealing vapor barrier laps and/or Sticky Tape™ (double-sided bonding tape) 3/4" wide by 1/32" thick extruded vapor barrier sealant by Thermal Design.

- G. Insulation: Shall be fiberglass blanket or batt insulation meeting Federal Specifications HH-1 588B, Form B, Type 1 or other insulation form as may be recommended and submitted by the system manufacturer and approved by the architect during submittals.
- H. Insulation Hangers: Shall be Fast-R™ insulation hangers for supporting insulation between wall girt or roof purlins in roof pitches over 4:12.
- I. Thermal Break (Block): Thermal break shall be: 3/8" polystyrene Snap-R thermal block. The selection shall be provided as thermal break where there is no existing thermal break.

Part III: Execution

3.1 Simple Saver Roof System:

- A. Cut to length and install painted steel straps in the pattern and spacings as shown on the project shop drawings. The straps are installed in tension and span immediately below the bottom plane of the purlins. Position the pre-folded vapor barrier liner fabric on the strap platform along one eave purlin. Clamp the two bottom corners squarely at the eave and centered on the bay. Pull the other end of the pleat-folded fabric across the building width on the strap platform but below the purlins, pausing only at the ridge to fasten the straps and fabric into position where the plane of the roof changes. Once positioned, the remaining fasteners are installed from the bottom side at each purlin/strap intersection and the edges are trimmed and sealed along the rafters. A similar method can be used starting at the ridge purlin space and pulling the fabric to each eave.
- B. Insulation is un-packed and placed on the vapor liner system. Shake to the specified thickness. In two-layer systems, the second layer of insulation is placed over and perpendicular to the purlins as the roof sheeting is applied. It is important that the insulation cavity be filled or the cavities be ventilated to minimize the probability of condensation. (Ventilated and/or dehumidified roof systems are possible with the Simple Saver System). Call Thermal Design (800-255-0776) for details.

3.2 Simple Saver Wall System:

- A. Sheet the building with just the thermal break (if specified) applied to the exterior of the girts. Insulation is cut to the required lengths to fit vertically between the girts and installed in the girt spaces on Fast-R insulation hangers. Fluff the insulation to the specified thickness, making sure there are no gaps or voids. Insulate the complete wall section. Apply the wall vapor barrier fabric by clamping it into position over the eave strap. Once in position, the fasteners are installed through the wall straps, eave strap and onto each roof strap, permanently clamping the wall fabric between them. Seal the wall fabric to the roof fabric to the base angle or base 'C' and on the column flanges. Additional straps are installed along the base angle and each column to retain the system permanently in place.

3.3 Detailed installation instructions

- A. Include with the project shop drawings specific for the project and included with the materials in each shipment. Pertinent information is included on the drawings for each project. Install in strict accordance with the manufacturers written instructions and drawings. The manufacturer's toll-free hotline is 800-255-0776.

END OF SECTION

SECTION 07 21 00 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Foam plastic insulation

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of insulation product specified.
- C. Samples for verification in full-size units of each type of exposed insulation indicated for each color specified.
- D. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.
- E. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence compliance of foam-plastic insulations with building code in effect for Project.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having

jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:
 1. Foam plastic insulation
 - a. Tailored Chemical Products, Inc. (Core-Fill 500 Insulation)
3719 1st Ave SW
Hickory, NC 28601

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
- B. Foam plastic insulation
 1. Nitrogen-based, non-toxic amino-plast resin, foaming catalyst and air.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Core-Fill 500 is to be installed after all masonry and structural concrete work is in place. A 7/8" hole is to be drilled in each vertical column of block cells 4' +/- above the floor level. The foam is to be pressure enjected into the cells at 120-160 PSI. This procedure is repeated every 10' +/- vertically (i.e. 14', 24', 34',...) of wall height until the void is completely full. The installer shall then patch their holes with mortar and score to match existing surface.

3.5 PROTECTION

- A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 22 00 - ROOF INSULATION**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work included: Roof insulation in minimum thicknesses of 3.5 inches.

1. Metal Roof Deck or Concrete Roof Deck.

The minimum 3.5" thickness tapered polyisocyanurate roof insulation board is to be laid dry over the roof deck and a ½" high density wood fiberboard is to be laid over the insulation and the complete assembly is to be staggered and mechanically attached at metal roof decks using a minimum of 5 fasteners in each 4' x 4' board. At concrete roof decks, the assembly is to be staggered and adhered to the concrete deck in accordance with the manufacturer's written instructions.

- B. Related Work:

1. Section 07515 - Elastomeric Sheet Roofing-Fully Adhered System

1.2 SCOPE

The roofing contractor shall furnish and install thermal insulation as described in this specification in strict accordance with the drawings.

1.3 QUALITY ASSURANCE

- A. The insulation shall be installed by a contractor authorized by the manufacturer/supplier of the membrane roof system.
- B. The insulation material shall be approved for use by the manufacturer/supplier and accepted for use by the membrane manufacturer/supplier.
- C. The insulation shall comply with U.S. Department of Commerce Simplified Practice Recommendation for thermal Conductance Factors for Pre-Formed above deck roof insulation No. R257-55. The insulation must be listed with UL Laboratories.
- D. The polyisocyanurate roof insulation shall comply with UL 723 (ASTM-E-84) surface burning classifications.
- E. The insulation manufacturer shall provide the requested typical physical property data and/or certification of compliance with such data.
- F. The insulation shall meet the minimum properties found in the ASTM specifications for the product type selected.

1.4 SUBMITTALS

- A. Shop drawings shall illustrate the complete drainage system, including board location, drain locations, insulation high points and low points.
- B. The roofing contractor will submit a letter from the membrane manufacturer/supplier stating that the roof insulation and its attachment meets their requirement to receive their membrane roof system.
- C. The roofing contractor will submit a letter from the FASTENER and/or ADHESIVE manufacturer/supplier stating the tests were made and reporting the results of each required test. The average is to be totaled and the recommended number of fasteners and/or application rate is to be stated to meet FM I-60.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered in packaging clearly labeled with the product board location shown for the tapered roof system. Care shall be taken to prevent damaging the insulation material during delivery, handling, and storage.
- B. All materials shall be stored off the ground and covered with a protective tarpaulin, secured against wind disturbance, and away from water and direct sunlight. Roof insulation must be stored away from all sources of ignition and excessively high temperatures. Any insulation which becomes wet prior to installation will be rejected and may not be installed on the Project.

1.6 JOB CONDITIONS

- A. The roofing contractor shall sweep/clean the roof deck prior to the installation of the insulation.
- B. When staging material on the roof and during the application, the contractor shall ensure that overloading of the deck and structure does not occur.
- C. Only as much roofing and insulation as can be installed and made watertight the same day shall be installed.
- D. The contractor shall conform to OSHA and other safety requirements during this operation.

PART 2 - PRODUCTS

2.1 INSULATION

- A. Tapered Polyisocyanurate roof board insulation integrally laminated with heavy non-asphaltic glass fiber-reinforced felt facer, ASTM C-1289-01, Type II, Class 1, FM

4450/4470 Class I fire Rating –with minimum thickness 3.5". System slope: ¼" per ft. Use 4'x4' boards adhered to a substrate.

1. Acceptable manufacturer/suppliers are:
 - a. Insulation approved and supplied by the manufacturer of the primary roof system and complying with other requirements set forth in this section.
 - b. Hunter Panels
 - c. Apache Products Company
 - d. Atlas Roofing Corporation
 - e. Firestone Building Products

B. High Density Wood Fiberboard

1. High Density Fiberboard- Insulating board (cellulosic fiber) structural shall be manufactured from refined or partly refined ligno-cellulosic (wood or cane) fibers, by a felting or molding process into homogeneous panels. Other ingredients may be added to provide or improve properties such as strength and water resistance, in addition to surface finishes for products and special coating which impart resistance to flame spread. The material is subjected to such drying temperatures as to affect complete destruction of rot producing fungi.
2. Shall meet: ASTM Designation C-208-95, Type II, Grade 2
FM Class 1 (FMRC Standard 4450/4470)
UL Class A Roof Covering
3. Compressive Resistance: 45 psi nominal (10% deformation, ASTM C165)
4. Acceptable Manufacturer/Suppliers are (High Density Wood Fiberboard):
 - a. Georgia Pacific (high density fiberboard)
 - b. Celotex (high density fiberboard)
 - c. High Density fiberboard Recommended by the Manufacturer of primary roof system AND complying with other requirements set forth in this section.

2.2 RELATED MATERIALS

- A. Fasteners:** A minimum of 5 fasteners per 4' x 4' insulation board is required or the required number of fasteners by the manufacturer if more stringent than the specified requirement.
1. Acceptable Manufacturers/Suppliers are: (Metal Roof Deck Systems)
 - a. Fasteners, required by the manufacturer of the primary roof system.
 - b. RAWL - #14 Screws
 - c. TRU-FAST - Tec-Tite Fasteners
 2. Fasteners shall be corrosion resistant coated and shall comply with FM Standard 4470.
 3. Fasteners shall be a minimum #14 shank diameter.
 4. Minimum penetration through steel deck shall be ¾" into top of flute.
- B. Wood nailers** are to be installed as indicated on the drawings. Wood nailers and blocking shall be pressure treated No. 2 or better Yellow Pine.

- C. ADHESIVE- Dual Component polyurethane adhesive
1. Dual Component Polyurethane adhesive: no HCFC; ASTM D-1621 Density; ASTM D-2843 Water Absorption; ASTM D-2856 Closed Cell Content
 2. Coverage Rates between 0.75 and 1.25 GAL / 100 SF to achieve minimum 60% to 75% adhesion.
 3. Warranty: Full 10-year material and adhesion warranty.
 4. Application: Apply adhesive and install boards in strict compliance with manufacturer's requirements. Boards must be placed into adhesive while it is still wet and tacky before it reaches its tack free state. Boards must be walked into place to assure complete adhesion. Application rates must be increased for rougher surfaces.
 5. Acceptable Manufacturers and Products include:
 - a. OlyBond 500 Adhesive- Olympic Manufacturing Group
 - b. Insulation adhesive recommended by the Manufacturer of the primary roof system AND complying with other requirements set forth in this Section.

PART 3 - EXECUTION

3.1 PREPARATION

- A. A pre-construction meeting will be held prior to installation of roofing and related work. It is mandatory that the Roofing Contractor, with his assigned foreman, meet with the Roof Consultant and Architect at the job site.
- B. Fasteners must be installed as detailed by FM on their Loss Prevention Data 1-30 and 1-48, latest edition.
- C. The new wood nailer's installed thickness shall conform to the same roof level as the new roof insulation over all roof decks.

3.2 SUBSTRATE INSPECTION/APPROVAL

- A. A proper substrate shall be provided to receive the insulation. The roofing contractor shall notify the Roof Consultant and the Architect in writing of any defects in the substrate. Work shall not proceed until the substrate has been repaired or replaced.
- B. Installation of the roofing system shall not commence until installation of the roof deck, all curbs, supports, and equipment is complete. The Roof Consultant and the Architect shall review the progress of the Work and approve the commencement of roof system installation.

3.3 SUBSTRATE PREPARATION

- A. The roof deck shall be smooth and without openings exceeding $\frac{1}{4}$ ", and any irregularities shall be scraped and removed so as to produce a flat, smooth surface. Insulation boards shall lay flat from one board to the next.

3.4 INSTALLATION

- A. Metal Roof Deck or Concrete Roof Deck.

The polyisocyanurate roof insulation board is to be laid dry over the roof deck and a $\frac{1}{2}$ " high density wood fiberboard is to be laid over the insulation and the complete assembly is to be staggered and mechanically attached at metal roof decks using a minimum of 5 fasteners in each 4' x 4' board. At concrete roof decks, the assembly is to be staggered and adhered to the concrete deck in accordance with the manufacturer's written instructions.

END OF SECTION

SECTION 07 27 00 - FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes firestopping for the following:
 - 1. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
 - 3. Sealant joints in fire-resistance-rated construction.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Section "Unit Masonry" for joint fillers for non-fire-resistive-rated masonry construction.
 - 2. Division 7 Section "Joint Sealants" for non-fire-resistive-rated joint sealants.
 - 3. Division 15 Sections specifying ducts and piping penetrations.
 - 4. Division 16 Sections specifying cable and conduit penetrations.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:
 - 1. Where firestop systems protect penetrations located outside of wall cavities.
 - 2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.

3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
 4. Where firestop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
- C. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
- D. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.
- E. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
- F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
 3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
 - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
- B. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.
- C. Installer Qualifications: Engage an experienced Installer who has completed firestopping that is similar in material, design, and extent to that indicated for Project and that has performed successfully.
- D. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- E. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.8 SEQUENCING AND SCHEDULING

- A. Do not cover up those firestopping installations that will become concealed behind other construction until authorities having jurisdiction, if required, have examined each installation.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
 - 1. Permanent forming/damming/backing materials including the following:
 - a. Semirefractory fiber (mineral wool) insulation.

- b. Ceramic fiber.
 - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - d. Fire-rated formboard.
 - e. Joint fillers for joint sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.
- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 **FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS**

- A. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.
- B. Ceramic-Fiber Sealant: Single-component formulation of ceramic fibers and inorganic binders.
- C. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
- D. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- E. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- G. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.
- H. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogenous mortar.
- I. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
 2. Grade for Vertical Surfaces: Nonsag grade for openings in vertical and other surfaces.
- L. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:
1. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
 2. Grade for Vertical Surfaces: Nonsag grade for openings in vertical and other surfaces.
- N. Products: Subject to compliance with requirements, provide one of the following:
1. Ceramic-Fiber and Mastic Coating:
 - a. FireMaster Bulk and FireMaster Mastic, Thermal Ceramics.
 2. Ceramic-Fiber Sealant:
 - a. Metacaulk 525, The RectorSeal Corporation.
 3. Endothermic, Latex Sealant:
 - a. Fyre-Shield, Tremco Inc.
 4. Endothermic, Latex Compounds:
 - a. Flame-Safe FS500/600 Series, International Protective Coatings Corp.
 - b. Flame-Safe FS900/FST900 Series, International Protective Coatings Corp.
 5. Intumescent Latex Sealant:
 - a. Metacaulk 950, The RectorSeal Corporation.
 - b. Fire Barrier CP 25WB Caulk, 3M Fire Protection Products.
 6. Intumescent Putty:
 - a. Pensil 500 Intumescent Putty, General Electric Co.
 - b. Flame-Safe FSP1000 Putty, International Protective Coatings Corp.
 - c. Fire Barrier Moldable Putty, 3M Fire Protection Products.
 7. Intumescent Wrap Strips:
 - a. Dow Corning Fire Stop Intumescent Wrap Strip 2002, Dow Corning Corp.
 - b. CS2420 Intumescent Wrap, Hilti Construction Chemicals, Inc.
 - c. Fire Barrier FS-195 Wrap/Strip, 3M Fire Protection Products.
 8. Job-Mixed Vinyl Compound:
 - a. USG Firecode Compound, United States Gypsum Co.
 9. Mortar:
 - a. K-2 Firestop Mortar, Bio Fireshield, Inc.
 - b. Novasit K-10 Firestop Mortar, Bio Fireshield, Inc.
 - c. KBS-Mortar Seal, International Protective Coatings Corp.
 10. Pillows/Bags:
 - a. Firestop Pillows, Bio Fireshield, Inc.
 - b. KBS Sealbags, International Protective Coatings Corp.
 11. Silicone Foams:
 - a. Dow Corning Fire Stop Foam 2001, Dow Corning Corp.
 - b. Pensil 200 Foam, General Electric Co.
 12. Silicone Sealants:
 - a. Dow Corning Firestop Sealant 2000, Dow Corning Corp.
 - b. Dow Corning Firestop Sealant SL 2003, Dow Corning Corp.
 - c. Pensil 100 Firestop Sealant, General Electric Co.
 - d. CS240 Firestop Sealant, Hilti Construction Chemicals, Inc.

- e. Metacaulk 835, The RectorSeal Corporation.
 - f. Metacaulk 880, The RectorSeal Corporation.
 - g. Fyre-Sil, Tremco Inc.
 - h. Fyre-Sil S/L, Tremco Inc.
13. Solvent-Release-Curing Intumescent Sealants:
- a. Biostop 500 Intumescent Firestop Caulk, Bio Fireshield, Inc.
 - b. Fire Barrier CP 25N/S Caulk, 3M Fire Protection Products.
 - c. Fire Barrier CP 25S/L Caulk, 3M Fire Protection Products.

2.3 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
- B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:
 - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.
- C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
 - 1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
 - a. 50 percent movement in both extension and compression for a total of 100 percent movement.
- D. Multicomponent, Nonsag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.
 - 1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage change in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
 - a. 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement.
- E. Single-Component, Nonsag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.
- F. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Single-Component, Neutral-Curing, Silicone Sealant:
 - a. Dow Corning 790, Dow Corning Corp.
 - b. Dow Corning 795, Dow Corning Corp.

- c. Silpruf, General Electric Co.
- d. Ultraglaze, General Electric Co.
- e. 864, Pecora Corp.
- 2. Multicomponent, Nonsag, Urethane Sealant:
 - a. Vulkem 922, Mameco International Inc.
 - b. Dynflex, Pecora Corp.
 - c. Dynatred, Pecora Corp.
 - d. Dynatrol II, Pecora Corp.
 - e. Sikaflex 2cn NS, Sika Corp.
 - f. Sonolastic NP 2, Sonneborn Building Products Div., ChemRex Inc.
 - g. Dymeric, Tremco Inc.
- 3. Single-Component, Nonsag, Urethane Sealant:
 - a. Isoflex 880 GB, Harry S. Peterson Co., Inc.
 - b. Isoflex 881, Harry S. Peterson Co., Inc.
 - c. Vulkem 921, Mameco International Inc.
 - d. Sikaflex--15LM, Sika Corp.

2.4 MIXING

- A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to

joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION

SECTION 07 51 50 – ELASTOMERIC SHEET ROOFING – FULLY ADHERED SYSTEM**PART 1 - GENERAL****1.1 GENERAL PROVISIONS**

- A. Related Work
 - 1. Section 7220 – Roof Insulation

1.2 DESCRIPTION OF WORK

- A. Extent of flexible sheet roofing (FSR) is limited to the patching, flashing and splicing to the existing roofing membrane where new holes are cut and new curbs are installed. The roofing is hereby defined as a non-traffic-bearing sheet membrane system intended for weather exposure as primary roofing.
- B. Types of flexible sheet roofing specified in this section include the following:

Minimum .060 Fully Adhered Elastomeric System Membrane is to be FR Rated.
- C. Flexible sheet roofing membranes shall be Ethylene Propylene Diene Monomer (EPDM).
- D. Roof insulation related to flexible sheet roofing is specified in Division 07220.

1.3 QUALITY ASSURANCE

- A. Manufacturer: Obtain primary flexible sheet roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.
- B. Installer: A firm with not less than 5 years of successful experience in installation of roofing systems similar to those required for this project and which is acceptable to or licensed by the manufacturer of existing primary roofing materials where modifications are being made.
- C. Bidding is limited to contractors holding a valid State of Tennessee Contractors License in the specialty category of Roofing and Sheet Metal.
- D. Pre-Roofing Conference: Prior to installation of roofing and associated work, meet at project site with installer, roofing manufacturer, installers of related work, and other entities concerned with roofing performance, including (where applicable) Owner's insurer, test agencies, governing authorities, Contracting Officer's Representative, Architect, and Roofing Consultant. Record discussions and agreement and furnish copy to each participant. Provide at least 72 hours advance notice to participants prior to convening pre-roofing conference.

- E. UL Listing: Provide labeled materials which have been tested and listed by UL for application indicated, with the following rating for roof slopes shown:
"Class A" rated materials for EPDM membrane sheeting only. EPDM Membrane Sheeting is to be Fire-Rated (FR).
- F. Wind Uplift Performance: Roofing System shall be applied to meet ASCE-7 and International Building Code wind uplift resistance AND minimum wind speed of 90 mph.
- F. Thermal Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having justification:
 - 1. Surface Burning Characteristics: ASTM E 84
 - 2. Fire Resistance Rating: ASTM E 119
 - 3. Combustibility Characteristics: ASTM E 136

1.4 SUBMITTALS

- A. Product Data: Submit specifications, installation instructions, and general recommendations from manufacturers of flexible sheet roofing system materials for types of roofing required. Include data substantiating that materials comply with requirements.
- B. Shop Drawings: Submit complete shop drawings showing roof configuration and sheet layout, details at perimeter, and special conditions.

1.5 JOB CONDITIONS

Weather: Proceed with roofing work when existing and forecasted weather permit work to be performed in accordance with Manufacturer's recommendations and warranty requirements.

1.6 SPECIAL PROJECT WARRANTY

- A. Provide written warranty, signed by manufacturer of primary roofing materials, agreeing to replace/repair defective materials and workmanship of the total roof system. The warranty shall be a NDL (no dollar limit) full weathertightness system guarantee. The warranty shall include all materials and workmanship installed by the approved Roofing Contractor without exceptions for non-compliant materials, techniques or details. The Roofing Contractor and Manufacturer shall be jointly responsible during the first two (2) year period; and if the Roofing Contractor is unable or unwilling to perform warranty repairs, the manufacturer shall be fully responsible. Thereafter, for the full term of the Warranty, the Manufacturer shall be fully responsible for all materials and workmanship by the Roofing Contractor. Maximum warranty wind speed shall be 73 mph.

- B. Warranty period for the roof system is for **FIFTEEN (15) YEARS** from the date of the Substantial Completion as established by the Architect.
- E. The Roofing Contractor shall provide a copy of his agreement with the Manufacturer and the Contractor. This agreement is to list all terms and conditions and the time limits for which the Roofing Contractor and Manufacturer are jointly and severally responsible for the Total Roof System which is being provided.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Performance: Provide roofing materials recognized to be of generic type indicated and tested to show compliance with indicated performances, or provide other similar materials certified in writing by manufacturer with application methods to be equal or better than specified in every significant respect, and acceptable to Contracting Officer's Representative.
- B. Compatibility: Provide products that are recommended by manufacturers to be fully compatible with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

2.2 EPDM FSR MEMBRANE – (FR RATED)

- A. Ethylene Propylene Diene Monomers formed into uniform, flexible sheets, complying with the following:
 - 1. Tensile Strength (ASTM D 412): 1400psi
 - 2. Ultimate Elongation (ASTM D 412): 450%
 - 3. Brittleness Temperature (ASTM D 746): -63 degrees F.
 - 4. Tear Resistance (ASRM D 624): 200 lbs. per inch.
 - 5. Resistance to Ozone Aging (ASTM D 1149): No cracks after 168 hours exposure of 50% elongated samples at 104 degrees F (40 degrees C) and 100 pphm ozone.
 - 6. Resistance to Heating Aging (ASTM D 573): Maximum reduction in elongation of 30% maximum loss of tensile strength of 15%, 168 hours at 240 degrees F (116 degrees C).
 - 7. Thickness: 60 mils minimum
 - 8. Exposed Face Color: Manufacturer's standard.

2.3 ELASTIC SHEET ROOFING-FULLY ADHERED SYSTEM

- A. Available Manufacturers: Subject to compliance requirements, manufacturers offering products, which may be incorporated in the work:
 - 1. Carlisle Syn Tec Systems
 - 2. Firestone Building Products Co.
 - 3. GenCorp (GenFlex)
 - 4. Versico, Inc.

2.4 MISCELLANEOUS MATERIALS FOR FSR

- A. Fully adhered sheet attachment shall be limited to 10 foot spacing regardless of the manufacturer approvals for greater spacing.
- B. The fully adhered attachment shall be in accordance to the manufacturer's approval from UL or FM.
- C. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by manufacturer of FSR system.
- D. Tapering and Flashing Accessories: Types recommended by manufacturer of FSR materials, provided at locations indicated and indicated at locations recommended by manufacturer, and including adhesive tape, flashing cements, and sealants.

2.5 INSULATION

- A. General: Provide insulating materials to comply with requirements indicated for materials and compliance with referenced standard; in sizes to fit applications indicated, selected from manufacturer's standard thickness, widths and length.
- B. Provide composite insulations as specified in Section 07220 and as listed on the Drawing.

2.6 ROOF WALKWAY PADS

- A. Provide products which are recommended by the manufacturer to be fully compatible with indicated conditions and materials.
- B. Contractor shall install walkway pads according to the manufacturer's recommendations for the type of roof system to be installed, including adhesive, spacing, and repositioning.

- C. Provide written certification from the manufacturer of the primary roofing system of acceptability of walkway pads to be used.
- D. Acceptable manufacturers and Products are:
 - 1. Walkway pads approved and supplied by the manufacturer of the primary roof system.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBSTRATE

- A. General: Comply with manufacturers' instructions for preparation of substrate to receive system.
- B. Clean substrate of dust, debris, and other substances detrimental to FSR system work. Remove sharp projections.
- C. Install tape strips, flashings, and accessory items as shown and as recommended by manufacturer even though not shown.

3.2 INSTALLATION

- A. General: Comply with manufacturers' instructions, except where more stringent requirements are indicated.
- B. Insulation Installation:
 - 1. General: Install insulation in accordance with Section 07220 – Roof Insulation.
 - 2. Do not install more insulation each day than can be covered with membrane before end of day and before start of inclement weather.
 - 3. The attachment of insulation materials shall be installed in parallel courses with end joints staggered with no joints greater than $\frac{1}{4}$ ". Gaps greater than $\frac{1}{4}$ " shall be filled with the same insulation product.

3.3 MEMBRANE INSTALLATION

- A. The Fully adhered Elastomeric System shall be installed according to the instruction as detailed by the manufacturer of the primary E. P. D. M. Roof System.
- B. The mechanical fastener and stress distribution plate, disc, bar, or strip specified for use in the adhered system shall meet all installation and specific requirements of the E. P. D. M. manufacturer and the wind load and uplift requirements as set forth herein.

- C. The E. P. D. M. manufacturer shall maintain a separate technical department with its own field inspectors. Manufacturer's Sales Representatives are not acceptable as Field Inspectors.
- D. Provide roof walkway pads around perimeter of new HVAC units on roof.
- E. A field inspection of the application in progress shall be made by the manufacturer's technical inspector. Copies of all progress inspections, the punch list and correspondence shall be forwarded to the Architect.
- F. A final inspection shall be made by the Roof System Manufacturer's technical inspector and a copy of the punchlist and written approval for warranty shall be sent to the Architect. A manufacturer's final inspection is mandatory even if not required by the manufacturer.

END OF SECTION

SECTION 07 63 00 – FLASHING, SHEET METAL, GUTTERS & DOWNSPOUTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section includes General Requirements for fabrication and installation of Custom Shop Made Hand Formed Sheet Metal Work formed to fit job conditions.
- B. Related Work:
 - 1. Section 06 10 00 - Rough Carpentry

1.2 SCOPE

- A. This section covers Flashing and Sheet Metal work including fabricating and installing sheet metal, copings, fascias and associated flashings, gutters and downspouts and all additional materials, labor, equipment and services necessary to complete this work.

1.3 QUALITY ASSURANCE

- A. This work is a custom shop made hand formed to fit the job conditions.
- B. Contractor: Work under this Section shall be performed by a Subcontractor principally engaged in and specializing in the performance of this work for a period of five (5) years.
- C. Workmanship: All sheet metal work shall comply with the "Standard Practice in Sheet Metal and Air Conditioning Contractors National Association, Inc., 5th Edition - Date 1993 with 1997 Addendum #1".
- D. **All dimensions are to be taken in the field by the contractor for a correct fit. The contractor is solely responsible for the measurements.**

1.4 SUBMITTALS

- A. Submit six (6) copies of each complete shop drawing detailing the configuration of the metal flashings showing the location of each panel.
- B. Samples and Manufacturer's literature:
 - 1. One (1) 6" x 6" sample 24 gauge flatsheet (KYNAR 500). Color to be selected by the Architect.
 - 2. Six (6) copies of the latest edition of each material specifications and installation instructions for the above.

1.5 COORDINATION

- A. Coordinate Work with other Trades affected.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protection: Use all means necessary to protect metal flashing and fascias, gutters and downspouts, curb flashings, and reglet flashings, before, during, and after installation and to protect the installed work and materials of all other Trades.
- B. Store shop fabricated sheet metal in an area that can be protected from damage.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Consultant and at no additional cost to the Owner.

1.7 JOB CONDITIONS

- A. The Contractor shall ensure that all flashings have been applied in a manner to direct water to the exterior of the building. Any material or condition, which will not permit the installation of the new roof system as designed, shall be reported immediately to the Architect. By proceeding with the work without the Architects

1.8 WARRANTY

- A. The contractor shall provide the Owner with a twenty (20) year warranty for any Kynar material, color and finish. Provision shall be included for signature of installer and manufacturer of material, limited only by acts of God and conditions beyond the manufacturer's control. The installer's and manufacturer's liability shall be for 100% of the replacement value of the material and shall include failure of color and failure of finish coating.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Fabricate and install metal flashings, fascia, gutters and downspouts from 24 gauge pre-finished metal flat sheets.
- B. Acceptable Manufacturers/Suppliers are:
 - 1. 24 gauge hot dipped galvanized steel flat sheets with KYNAR 500 finish. Color to match roof panel color as selected by the Architect from the pre-engineered metal building roof panel manufacturer's standard colors.
 - a. Peterson Aluminum Corporation
 - b. DuraClad (Tuff-Clad)
 - c. Copper Sales (Una-Clad)

2.2 CLEATS

- A. Fabricate all cleats from 24 gauge flatsheet in same configuration as sheet metal work they are to mate with.
- B. Acceptable Manufacturers/Suppliers are:
 - 1. 24 gauge hot dipped galvanized steel flat sheets with KYNAR 500 finish. Color to be selected by the Architect.
 - a. Peterson Aluminum Corporation
 - b. DuraClad (Tuff-Clad)
 - c. Copper Sales (Una-Clad)

2.3 RELATED MATERIALS

- A. Sealant shall be one component polyurethane sealant conforming to ASTM Designation C-920, Paragraph 5.1.4 Grades and 5.1.6 Class 2-1/2.
- B. Elastomeric preformed polyisobutylene sealant tape, 100% solids, non-hardening. Recommended and approved by sheet metal component manufacturer.

2.4 FASTENINGS

- A. Screws: Self-tapping sheet metal type FS FF-S-107.
- B. Nails, brads, staples, and spikes: FS-FF-N-105.
- C. Bolts, hexagon and square: FS-FF-B-575C.
- D. Rivets: Material, type and size recommended by sheet metal manufacturer.

2.5 SHEET METAL FLASHING, GUTTERS AND DOWNSPOUTS (FABRICATION)

- A. Sheet metal flashing and fascias shall be fabricated in general accordance with the design drawings and shop drawings submitted. Specific details shall be in accordance with Chapter 2-SMACNA Architectural Manual - 5th Edition.
- B. Gutters shall be 6" box style (Style D, Figure 1-2) and shall be installed in accordance with SMACNA Figure 1-13A, with spacers, and with 3/16" x 2" brackets set on 36" centers. (SMACNA Architectural Manual - 5th Edition) Provide expansion joints at 50'-0" o.c. maximum.

- C. Gutter Downspouts shall be plain rectangular and fabricated in accordance with SMACNA Figure 1-31A and installed with hangers in accordance with Figure 1-35G. (SMACNA Architectural Manual - 5th Edition)
- D. Gravel stops are to be shop fabricated and installed in accordance with SMACNA Figure 2-1A. Note: Omit raised dam at drainage edges (SMACNA Architectural Manual - 5th Edition)
- E. Curb and reglet counterflashing shall be fabricated and installed in accordance with SMACNA Figure 4-4D. (SMACNA Architectural Manual -5th Edition)
- F. Reglet flashing shall be fabricated and installed in accordance with SMACNA Figure 4-46. (SMACNA Architectural Manual - 5th Edition)
- G. Spill-out scupper and conductor head shall be fabricated and installed in accordance with Figure 1-28. (SMACNA Architectural Manual — 5th Edition)
- H. Conductor heads shall be fabricated and installed in accordance with SMACNA Figure 1-2SF. (SMACNA Architectural Manual — 5th Edition)

2.6 PIPE SUPPORTS

- A. Furnish and install new pipe supports for all conduit and piping. Recommended spacing is 8 ft. to 15 ft. between supports and on each side of changes of direction and unions.
- B. Products which may be incorporated into the Work include:
 - (a) PipeGuard by OMG Roofing Products
- C. Accessories EPDM Riser block, 4" x 6" adhered to pipe support as necessary for required height.
- D. Installation: Provide and install EPDM separator pad beneath each pipe support. Pad shall be approved by roof manufacturer.

2.7 SPLASH PANS AND SPLASH BLOCKS

- A. Splash pans are to be used where roofs are at a different level and the higher roof drains onto the lower roof. Fabricate the splash pans for installation as follows:
 - (a) Back Height 4 inches
 - (b) Back Width 4 inches greater than downspout
 - (c) Sides Tapered from 4 inches to 1 inch
 - (d) Front Width 18 inches
 - (e) Length 30 inches
 - (f) Downspout Elbow Terminates 1 inch above back of splash pan

Installation shall be in accordance with SMACNA Figure 1-36 (SMACNA Architectural Manual -5th Edition)

- B. Contractor shall provide and install pre-cast concrete splash blocks where downspouts discharge at ground level and there is no underground drainage system present.

2.8 NAILER ATTACHMENT

- A. All nailers, both new and existing, shall meet the following attachment requirements:
1. Nails used to secure wood such as fascias, cant strips and top nailers to other wood members shall be long enough to penetrate 1-1/4 in. Two rows are recommended, staggered if possible. Spacing in any one row shall not exceed 24 in. Spacing shall not exceed 12 in., 8 ft each way from outside corners.
 2. Bolts anchoring wood nailers to concrete masonry walls shall be 1/2 inch diameter spaced 4 ft apart, staggered if the nailer is wider than 6 in. At outside building comers bolts shall be 2 ft apart for 8 ft each way from the corner. As an alternate, 3/8 inch bolts may be spaced 2 ft -8 in. o.c. and 16 in. o.c. at comers.
 3. Metal Gravel Guard and Fascia-
Gravel guards shall be installed in lengths of 8 to 10 ft. Minimum joint lap shall be 2 in. with a full bead of plastic roofing cement in between the lap or space ends and a 4 inch wide cover plate. The roof flange (horizontal part) shall be set over the roofing membrane(s) in a solid troweled coat of plastic roofing cement, sealant, or as recommended by Roofing Manufacturer, and shall be nailed 1 in. from the back edge at 4 in. o.c.
 4. Nailer on steel deck, parallel to ribs: When fastening wood nailers that are parallel to steel deck ribs (deck span 7 ft or less), attach the nailer to each roof joist with a minimum 3/4 in. steel bolt. For deck spans greater than 7 ft. a steel angle welded to the structure is required to limit nailer deflection. Use minimum 3/4 in. steel bolts spaced maximum 4 ft o.c. to attach nailer to angle. As an alternate method, the nailer may be secured to the deck with two rows of No. 10 galvanized steel metal screws at maximum 24 in. o.c. A galvanized steel washer minimum 5/8 in. outside diameter shall be used under the screw heads.
 5. Nailer on steel deck, perpendicular to ribs: Nailer shall be fastened to the deck with two rows of No. 10 galvanized sheet metal screws at maximum 24 in. o.c. When the deck is nonmetal, use anchors of equivalent strength at the same spacing.
 6. Sheet Metal Cleats shall be continuous unless shown otherwise and at least one gauge heavier than the fascia metal. Cleats shall be secured with annular threaded nails long enough to penetrate the wood minimum 1-1/4 in. The nail head should be 3/16 inch minimum. When screws are used, they should be No. 8 minimum and long enough to penetrate wood minimum 3/4 in. or metal minimum 3/8 in. Fasteners shall be either corrosion-resistant steel or treated to resist corrosion. Where estimated roof field area velocity pressures are less than 30 psf or Class 1-60, the maximum fastener spacing shall be 24 in. o.c. maximum. For pressures greater than 30 psf or Class 1-60, spacing shall be 16 in. o.c. maximum.

2.9 METAL PITCH POCKET

- A. Fabricate and install 24 gauge sheet metal pitch pocket minimum of 4" in height (above finished roof surface) with a 4 minimum flange and soldered or welded closed corners.
- B. Fill completely with two-component, solvent-free, polyurethane-based pitch pocket filler. Fill so that water is shed from the surface away from the actual penetration. Do not thin Pourable Sealer or use partial quantities. No grouts or fillers will be accepted.

- C. Surfaces must be structurally clean, dry (no frost) and structurally sound, free of contaminants, including but not limited to dust, dirt, loose particles, tar, asphalt, rust, mill oil, etc. Any paint or coating that cannot be removed must be tested to verify adhesion of the sealant or to determine the appropriate surface preparation if needed.
- D. Acceptable two-component sealer products are:
 - (a) Firestone Pourable Sealer
 - (b) J-M Pourable Sealer
 - (c) Carlisle Sure-Seal
 - (d) Chem-Link ProPack

2.10 PREFABRICATED PITCH POCKET SYSTEMS:

- A. A pre-fabricated inter-locking pitch pan system, composed of a high strength, flexible polyurethane elastomer, assembled on site, and filled with fast setting, pourable sealer. 10-year weathertightness warranty.
- B. Sealer One-part moisture curing pourable sealant for use in Penetration Seals or pitch pockets, approved by pitch packet system manufacturer.
- C. Acceptable Pitch Pocket Systems are:

2.11 COPING

- A. Fabricate and install a 16 gauge galvanized steel (spring type) plate over the wall sections that receive new formed coping. Straight coping are required and shall be fabricated and supplied by a single manufacturer.
 - 1. The 16 gauge galvanized plate shall cover the entire width of the top of the wall section as detailed on the drawings. The plate shall be anchored over the top of the membrane flashing into the wall secured with anchors according to FM-Perimeter Flashing Data Sheet 1-49.
 - 2. Coping shall be certified by the manufacturer to meet performance design criteria according to the following test standards:
 - (a) ANSI/SPRI ES-I Test Method RE-3 for Coping: Wind Design Standard for Edge Systems Used with Low-slope Roofing Systems.
 - 3. Plastic parts with masonry anchors are not to be used.
 - 4. The snap type coping shall be fabricated in accordance with SMACNA Figure 3-4A. 6th Edition, out of 24 gauge hot-dipped galvanized steel flatsheets with a Kynar 500 finish. Color to be approved by the Architect
 - 5. Coping shall be fully supported by a tapered strip of E.P.S. insulation. The E.P.S. is to be cut to correct dimensions for a proper fit under the coping for full support.
 - 6. Coping shall be fabricated with inside and outside corners mitered and quick-seamed and with unbroken face. All coping materials shall be fabricated from same lot and run of coil stock. Finish warranty requirements shall apply to all coping assemblies, including fabricated corners. Exposed fasteners are not permitted.

7. Sealant color shaft match coping color.
8. Concealed splice plates, 8" wide, finish to match coping cap with factory applied dual non-curing sealant strips.
9. Corners, end caps, pier caps, and other specialty components shall be fabricated by the coping manufacturer,

2.12 SOFFITS:

Provide and install new metal soffits where indicated on drawings. Soffits shall be Pac-Clad PAC-750, .032 aluminum, fully vented, complete with all trim and support system. Color to be selected by Architect from manufacturers standard cobra 70% Kynar 500 finish.

PART 3 - EXECUTION

3.1 SURFACE CONDITONS

- A. Inspection
 1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 2. Verify that metal coping, gravel stop, guttering, flashing, and sheet metal may be installed in accordance with the original design, all pertinent codes, regulations, and the reference standards.
 3. Care should be taken as work proceeds over the finished roof area.
 4. All wood is to be checked for soundness and its ability to hold fasteners attaching the new sheet metal.
- B. Discrepancies
 1. In the event of discrepancy, immediately notify the Architect.
 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
 3. Examine all subsurfaces to receive work. Report in writing to the Architect any conditions detrimental to the work. Failure to observe this injunction constitutes a waiver to any subsequent claims to the contrary and holds the Contractor responsible for any corrections the Designer may require. Commencement of the work shall be construed as acceptance of all subsurfaces.

3.2 MEASUREMENTS

- A. Verify all dimensions shown on the drawings by taking field measurements, proper fit and attachment of all parts is required. Measurements and dimensions are the sole responsibility of the contractor.

3.3 WORKMANSHIP

A. General

1. Form all sheet metal accurately to the dimensions and shapes required, in strict accordance with SMACNA standards, finishing all molded and broken surfaces with true, sharp, and straight lines and angles, and where intercepting other members, to an accurate fit and soldering securely.
2. All metal work and all finishes shall have all joints and corners accurately machined, filed and fitted, rigidly framed together and connected. All components shall be matched to produce perfect continuity of line and design. All joints and connections in exterior shall be made watertight.
- A. Unless otherwise specifically permitted by the Architect, turn all exposed edges back $\frac{1}{2}$ ".
4. Install all metal wall panels and soffit panels in strict accordance with manufacturers instructions using all required clips, fasteners, trim pieces, moldings and tools as required.

3.4 ATTACHMENT

- A. Whenever possible, secure metal by means of clips or cleats.
- B. In general, space all rivets and screws not more than 8" apart and, when exposed to the weather, use lead washers.
- C. For attaching into wood, use angler roofing nails 1 $\frac{1}{4}$ " long by 11 gauge.
- D. For nailing into concrete, use drilled plugholes and plugs.

3.5 EMBEDMENT

- A. Embed all metal in connection with roofs in a solid bed of caulking, using materials and methods approved by the Roofing System Manufacturer.

3.6 WATERPROOFING

- A. Finish watertight and weathertight.
- B. Make all lock seams work flat and true to line.
- C. Make all flat and lap seams in direction of flow.

3.7 CLEAN-UP

- A. Leave work clean and free of stains, scrap, and debris.
- B. Remove all excess materials and debris from the site.

END OF SECTION

SECTION 07 90 10 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes joint sealants for the following locations:
 - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
 - a. Control and expansion joints in unit masonry.
 - b. Perimeter joints between materials listed above and frames of doors and windows.
 - c. Control and expansion joints in ceiling and overhead surfaces.
 - d. Other joints as indicated.
 - 2. Exterior joints in horizontal traffic surfaces as indicated below:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
 - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - f. Perimeter joints of toilet fixtures.
 - g. Other joints as indicated.
 - 4. Interior joints in horizontal traffic surfaces as indicated below:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 7 Section "Flashing and Sheet Metal" for sealing joints related to flashing and sheet metal for roofing.
 - 2. Division 9 Section "Gypsum Drywall" for sealing concealed perimeter joints of gypsum board partitions to reduce sound transmission.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
- B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data from manufacturers for each joint sealant product required.
- C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples in 1/2-inch (13-mm) wide joints formed between two 6-inch (150-mm) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.
- C. Field-Constructed Mock-Ups: Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution:
 - 1. Joints in field-constructed mock-ups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants specified in this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
 - 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
 - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.
- B. Products: Subject to compliance with requirements, provide one of the products specified in each Elastomeric Joint Sealant Data Sheet.

2.3 SOLVENT-RELEASE-CURING JOINT SEALANTS

- A. Acrylic Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for Project without failing cohesively:
1. 7-1/2 percent movement in both extension and compression for a total of 15 percent.
- B. Butyl Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be nonstaining, paintable, and have a tack-free time of 24 hours or less.
- C. Pigmented Narrow Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for sealing joints **3/16 inch (5 mm)** or smaller in width.
- D. Available Products: Subject to compliance with requirements, solvent-release-curing joint sealants that may be incorporated in the Work include, but are not limited to, the following:
- E. Products: Subject to compliance with requirements, provide one of the following:
1. Acrylic Sealant:
 - a. "60+Unicrylic," Pecora Corp.
 - b. "PTI 738," Protective Treatments, Inc.
 - c. "PTI 767," Protective Treatments, Inc.
 - d. "Mono," Tremco, Inc.
 2. Butyl Sealant:
 - a. "BC-158," Pecora Corp.
 - b. "PTI 757," Protective Treatments, Inc.
 - c. "Sonneborn Multi-Purpose Sealant," Sonneborn Building Products Div., ChemRex, Inc.
 - d. "Tremco Butyl Sealant," Tremco, Inc.
 3. Pigmented Narrow Joint Sealant:
 - a. "PTI 200," Protective Treatments, Inc.

2.4 LATEX JOINT SEALANTS

- A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates

indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

- B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
- C. Silicone Emulsion Sealant: Provide product complying with ASTM C 834 and, except for weight loss measured per ASTM C 792, with ASTM C 920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.
- D. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acrylic-Emulsion Sealant:
 - a. "AC-20," Pecora Corp.
 - b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
 - c. "Tremco Acrylic Latex 834," Tremco, Inc.
 - 2. Silicone-Emulsion Sealant:
 - a. "Trade Mate Paintable Glazing Sealant," Dow Corning Corp.

2.5 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Open-cell polyurethane foam.
 - 2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
 - 3. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.
 - 4. Any material indicated above.
- C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form release agents from concrete.
 - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 - 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use

tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.

- G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

PRODUCT DATA SHEET 1 - ELASTOMERIC JOINT SEALANT

- A. Elastomeric Joint Sealant Designation: ES1 Sealant.
- B. Base Polymer: Polyurethane.
- C. Type: M (multicomponent).
- D. Grade: NS (nonsag).
- E. Class: 12-1/2
- F. Use[s] Related to Exposure: T (traffic) and NT (nontraffic).
- G. Products: Pecora Dynaflex (NT), or equal. Pecora NR200 Wrexpan (T), or equal.

END OF SECTION

SECTION 08 11 00 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes steel doors and frames.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 8 Section "Door Hardware" for door hardware and weatherstripping.
 - 2. Division 9 Section "Painting" for field painting primed doors and frames.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
- C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
 - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.4 QUALITY ASSURANCE

- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.
- B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152,

and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum **4-inch**-high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum **1/4-inch** spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Steel Doors and Frames:
 - a. Amweld Building Products, Inc.
 - b. Benchmark Commercial Doors.
 - c. Ceco Door Products.
 - d. Copco Door Co.
 - e. Curries Co.
 - f. Deansteel Manufacturing Co.
 - g. Fenestra Corp.
 - h. Kewanee Corp.
 - i. Mesker Door, Inc.
 - j. Pioneer Industries.
 - k. Republic Builders Products.
 - l. Steelcraft.

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with **ASTM A 569**.
- B. Cold-Rolled Steel Sheets: Carbon steel complying with **ASTM A 366**, commercial quality, or **ASTM A 620**, drawing quality, special killed.

- C. Galvanized Steel Sheets: Zinc-coated carbon steel complying with [ASTM A 526](#), commercial quality, or [ASTM A 642](#), drawing quality, hot-dip galvanized according to [ASTM A 525](#), with A 60 or G 60 coating designation, mill phosphatized.
- D. Supports and Anchors: Fabricated from not less than [0.0478-inch](#)- thick steel sheet; [0.0516-inch](#)- thick galvanized steel where used with galvanized steel frames.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.3 DOORS

- A. Steel Doors: Provide [1-3/4-inch](#)- thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:
 - 1. Exterior Doors: Grade II, heavy-duty, Model 1, full flush design, minimum [0.0516-inch](#)- ([1.3-mm](#)-) thick galvanized steel sheet faces.

2.4 FRAMES

- A. Provide metal frames and mullions for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum [0.0478-inch](#)- ([1.2-mm](#)-) thick cold-rolled steel sheet.
 - 1. Fabricate frames and mullions with mitered or coped and continuously welded corners.
 - 2. Fabricate frames for interior openings over [48 inches](#) ([1220 mm](#)) wide from [0.0598-inch](#)- ([1.5-mm](#)-) thick steel sheet.
 - 3. Form exterior frames from [0.0635-inch](#)- ([1.6-mm](#)-) thick galvanized steel sheet.
- B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.
- C. Plaster Guards: Provide minimum [0.0179-inch](#)- ([0.45-mm](#)-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- D. Grout: When required in masonry construction, as specified in Division 4 Section "Unit Masonry."

2.5 FABRICATION

- A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before

shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.

1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
 - a. Rigid polyurethane conforming to ASTM C 591.
 2. Clearances: Not more than **1/8 inch** at jambs and heads, except not more than **1/4 inch** between non-fire-rated pairs of doors. Not more than **3/4 inch** at bottom.
 - a. Fire Doors: Provide clearances according to NFPA 80.
- B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel sheet.
- C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- E. Galvanized Steel Doors, Panels, and Frames: For the following locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum **0.0635-inch- (1.6-mm-)** thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.
 1. At exterior locations and where indicated.
- F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- G. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
 1. Unless otherwise indicated, provide thermal-rated assemblies with U-value rating of **0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K)** or better.
- H. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.
 1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.
- I. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- J. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

- K. Glazing Stops: Minimum 0.0359-inch- (0.9-mm-) thick steel or 0.040-inch- (1-mm-) thick aluminum.
 - 1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
 - 2. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers and organic finishes to doors and frames after fabrication. Field paint all components of steel doors and frames.

2.7 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 - 1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.8 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.

- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
 2. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
 3. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
 4. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
 5. Install fire-rated frames according to NFPA 80.
- C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.
1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
 2. Smoke-Control Doors: Comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

SECTION 08 21 10 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid core doors with wood veneer faces.
 - 2. Louvers for flush wood doors.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
- C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.
 - 1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.

1.4 QUALITY ASSURANCE

- A. Quality Standard: Comply with the following standard:
 - 1. NWWDA Quality Standard: I.S.1-A, "Architectural Wood Flush Doors," of the National Wood Window and Door Association.
 - 2. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.
- B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 - 1. Test Pressure: Test at atmospheric pressure.
- C. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.
- B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.6 PROJECT CONDITIONS

- A. Conditioning: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:
 - 1. AWI quality standard Section 100-S-11 "Relative Humidity and Moisture Content."

1.7 WARRANTY

- A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span, or do not conform to tolerance limitations of referenced quality standards.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
 - 2. Warranty shall be in effect during the following period of time after date of Substantial Completion.
 - a. Solid Core Interior Doors: Lifetime

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors that may be incorporated in the Work include, but are not limited to, the following:
1. Solid Core Doors:
 - a. Algoma Hardwoods Inc.
 - b. Eggers Industries, Architectural Door Division.
 - c. Fenestra Corporation.
 - d. Weyerhaeuser Co.

2.3 INTERIOR FLUSH WOOD DOORS

- A. Solid Core Doors for Transparent Finish: Comply with the following requirements:
1. Faces: Red oak, rotary sliced.
 2. Grade: Custom.
 3. Construction: 5 plies.
 4. Core: Particleboard core.
 5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.
- B. Fire-Rated Doors: Comply with the following requirements:
1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as required to provide fire rating indicated.
 2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated and as follows:
 - a. 5-inch top-rail blocking.
 - b. 5-inch bottom-rail blocking, at doors indicated to have kick, mop, or armor plates.
 - c. 4-1/2-by-10-inch lock blocks.
 - d. 5-inch midrail blocking, at doors indicated to have exit devices.
 - e. As necessary to eliminate need for through-bolting hardware.
 3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
 4. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.4 VENEER MATCHING

- A. Within Door Faces: Provide doors with the following veneer matching:

1. Book matching.

2.5 LOUVERS

- A. Metal Louvers: Size, type, and profile shown and fabricated from the following:
 1. Natural Aluminum: Extruded aluminum with natural-anodized finish complying with AA-C22A31, Class II.

2.6 FABRICATION

- A. Fabricate flush wood doors to comply with following requirements:
 1. In sizes indicated for job-site fitting.
 2. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:
 - a. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-resistance-rated doors.
 3. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.
 - a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.
 - b. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Louvers: Factory install louvers in prepared openings.

2.7 FINISH

- A. Provide doors unfinished to the job site ready for finishing in the field.
 1. Division 9 Section "Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames prior to hanging door:
 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.

2. Reject doors with defects.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation see Division 8 Section "Door Hardware."
- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
1. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch at jambs and heads, 1/16 inch per leaf at meeting stiles for pairs of doors, and 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch clearance from bottom of door to top of threshold.

3.3 ADJUSTING AND PROTECTION

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 08 41 00 - ALUMINUM STOREFRONT SYSTEMS (Windows)**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior storefront systems(Windows).
- B. Related sections include the following:
 - 1. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
 - 2. Division 8 Section "Glazing."

1.3 SYSTEM DESCRIPTION

- A. General: Provide aluminum storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
 - 1. Air infiltration and water penetration exceeding specified limits.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Structural Silicone-Sealant Joints: Provide systems with structural silicone-sealant joints complying with the following requirements:
 - 1. Tensile or shear stress in joints is less than 20 psi.
- D. Thermally Broken Construction: Provide systems that isolate aluminum exposed to exterior from aluminum exposed to interior with a material of low thermal conductance.
- E. Wind Loads: Provide storefront systems, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.
 - 1. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller, unless otherwise indicated.

2. Static-Pressure Test Performance: Provide entrance and storefront systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
 - a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
 - b. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.
- F. Seismic Loads: Provide storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.
- G. Air Infiltration: Provide storefront systems with permanent resistance to air leakage through fixed glazing and frame areas of not more than 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft..
- H. Water Penetration: Provide storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 8 lbf/sq. ft.. Water leakage is defined as follows:
 1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
- I. Thermal Movements: Provide entrance and storefront systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- J. Structural-Support Movement: Provide storefront systems that accommodate structural movements including, but not limited to, sway and deflection.
- K. Condensation Resistance: Provide storefront systems with condensation resistance factor (CRF) of not less than 60 when tested according to AAMA 1503.1.
- L. Average Thermal Conductance: Provide storefront systems with average U-values of not more than 0.58 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.
- M. Dimensional Tolerances: Provide storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop Drawings: For storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.
- C. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
- D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.
- B. Source Limitations: Obtain each type of storefront system through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
 - 1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: (Drawings and specs based on Kawneer 451T Framing System)
1. Butler Manufacturing Company; Vistawall Architectural Products.
 2. International Aluminum Corporation; U.S. Aluminum.
 3. Kawneer Company, Inc.
 4. YKK AP America Inc.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Bars, Rods, and Wire: ASTM B 211.
- B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.
- C. Glazing as specified in Division 8 Section "Glazing."
- D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
- E. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.
- F. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."
- G. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.3 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - 1. Fabricate components for screw-spline frame construction.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- F. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."
- G. Glazing Channels: Provide minimum clearances for thickness and type of plastic sheet indicated according to plastic sheet manufacturer's written instructions.
- H. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- I. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.4 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- D. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.
- G. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.
- H. Erection Tolerances: Install storefront systems to comply with the following maximum tolerances:

1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 ADJUSTING AND CLEANING

- A. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 8 Section " Steel Frames" for silencers integral with hollow metal frames.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.
- B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
 - a. Type, style, function, size, and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.
 - h. Keying information.
 - 2. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the

product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

- D. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
 - 1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

1.5 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.6 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Butts and Hinges:
 - a. Hager Hinge Co.
 - b. Stanley
 - c. McKinney
 2. Cylinders and Locks:
 - a. Corbin & Russwin Architectural Hardware, Part of ASSA ABLOY Group.
 3. Exit/Panic Devices:
 - a. Corbin & Russwin Architectural Hardware, Part of ASSA ABLOY Group (ED 8200)
 4. Push/Pull Units:
 - a. Corbin & Russwin Architectural Hardware, Part of ASSA ABLOY Group
 - b. Hager Hinge Co.
 - c. H. B. Ives, A Harrow Company.
 - d. Triangle Brass Manufacturing Company (Trimco).
 5. Overhead Closers:
 - a. Corbin & Russwin Architectural Hardware, Part of ASSA ABLOY Group
 6. Kick, Mop, and Armor Plates:
 - a. Rockwood
 7. Door Stripping and Seals:
 - a. National Guard Products, Inc.
 - b. Pemko Manufacturing Co., Inc.
 - c. Hager
 8. Thresholds:

National Guard Products, Inc.
 9. Silencers:

Glynn- Johnson
 10. Flatgoods, Stops:

Rockwood
 11. Bi-fold:

Stanley

2.2 SCHEDULED HARDWARE

- A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:
1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article "Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.

2.3 MATERIALS AND FABRICATION

- A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.
- C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
- E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.4 HINGES, BUTTS, AND PIVOTS

- A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Screws: Provide Phillips flat-head screws complying with the following requirements:

1. For metal doors and frames install machine screws into drilled and tapped holes.
 2. For wood doors and frames install wood screws.
 3. Finish screw heads to match surface of hinges or pivots.
- C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
1. Out-Swing Exterior Doors: Nonremovable pins.
 2. Out-Swing Corridor Doors with Locks: Nonremovable pins.
 3. Interior Doors: Nonrising pins.
 4. Tips: Flat button and matching plug, finished to match leaves.
- D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors **90 inches (2250 mm)** or less in height and one additional hinge for each **30 inches (750 mm)** of additional height.

2.5 LOCK CYLINDERS AND KEYING

- A. Except as otherwise indicated, all locks shall be masterkeyed to an existing system with bitting list provided by owner. Provide restricted keyway cylinders as required on exterior doors. All exterior cylinders shall be Corbin Russwin Interchangeable core, H0 keyway. **No substitutions**. All interior door cylinders shall be Russwin Interchangeable core, D1 keyway. **No substitutions**.
- B. Flush Bolt Heads: Minimum of **1/2-inch- (13-mm-)** diameter rods of brass, bronze, or stainless steel with minimum **12-inch- (300-mm-)** long rod for doors up to **84 inches (2100 mm)** in height. Provide longer rods as necessary for doors exceeding **84 inches (2100 mm)** in height.

2.6 PUSH/PULL UNITS

- A. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation, thru-bolted for matched pairs but not for single units.

2.7 CLOSERS AND DOOR CONTROL DEVICES

- A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.
- B. Provide thru-bolt attachment of all closers and panic devices.

2.8 HARDWARE FINISHES

- A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers."
- F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
 - 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

- D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:
1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
 2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
 3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
 4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.3 HARDWARE SCHEDULE

List of Materials & Manufacturers

| Item | Specified | Approved |
|--------------|----------------|-----------------|
| Cont. Hinges | Roton | Stanley, Hager |
| Hinges | Stanley | Hager, McKinney |
| Lock sets | Corbin-Russwin | No Substitute |
| Closers | Corbin-Russwin | No Substitute |
| Exit Devices | Corbin-Russwin | Von Duprin |
| Flatgoods | Rockwood | Hager, Ives |
| Silencers | Glynn Johnson | Hager, Ives |

Set #1 door #1

- 2 ea. Roton hinges 780-210 HD
- 2 Exit Devices ED 5200 x L955 630
- 2 Cylinder 3080 626 restricted
- 2 Shim Kits M58 R
- 2 Door Closers DC 2210 A4 689 x M54
- 1 Removable Mullion
- 2 Sets Weatherstripping 5050 L.A.R.
- 1 Threshold 896 AV L.A.R.

Set #2 door #2

- 1 ea. Roton hinges 780-210 HD
- 1 Exit Devices ED 5200 x L955 630
- 1 Cylinder 3080 626 restricted
- 1 Door Closers DC 2210 A4 689 x M54
- 1 Set Weatherstripping 5050 L.A.R.
- 1 Threshold 896 AV L.A.R.

Set #3 door #3

- 6 ea Hinges BB 1173 4.5 626
- 6 Back Plates 417 4.5 626
- 2 Exit Devices ED 5400 x L955 630 M55
- 2 Cylinder 3080 626

- 2 Shim Kits M58 V
- 2 Door Closers DC 2210 689 x M54
- 2 Door Stops 440 626
- 2 Silencers

Set #4 door #4

- 3 ea. Hinges BB 1173 4.5 626
- 3 Back Plates 417 4.5 626
- 1 Lock set ML 2051 LWA 630 C6
- 1 Door Stops 440 626
- 3 Silencers

Set #5 doors #9

- 6 ea. Hinges BB 1173 4.5 626
- 6 Back Plates 417 4.5 626
- 1 Lock set ML 2055 LWA 630 C6
- 1 Set Flush Bolts 845 626
- 2 Door Closer DC 2210 689xM54
- 1 Coordinator 672xAB
- 2 Door Stops or Wall Bumpers as Required
- 2 Silencers

Set #6 doors #5, 6 & 10

- 3 ea. Hinges BB 1173 4.5 626
- 3 Back Plates 417 4.5 626
- 1 Lock set ML 2057 LWA 630 C6
- 1 Door Closer DC 2210 689xM54
- 1 Door Stop or Wall Bumper as Required
- 3 Silencers

Set #7 doors #7 & 8

- 3 ea. Hinges BB 1173 4.5 626
- 3 Back Plates 417 4.5 626
- 1 Dead Lock DL 4017 626 C6
- 1 Push Plate 70F 8x16 630 c/c
- 1 Pull Plate 105 x 70 630
- 1 Door Closer DC 2200 689xM54
- 1 Door Stop 440 626
- 3 Silencers

END OF SECTION

SECTION 08 80 00 - GLAZING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section.
 - 1. Interior windows.
 - 2. Interior and Exterior Vision lites in doors.
 - 3. Exterior windows

1.3 DEFINITIONS

- A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

1.5 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each glass product and glazing material indicated.
- C. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
 - 1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification

agency or independent testing agency acceptable to authorities having jurisdiction.

- D. Compatibility test report from manufacturer of insulating glass edge sealant indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.
- E. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
 - 1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
- C. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Fire-Resistive Glazing Products for Window Assemblies: Products identical to those tested per ASTM E 163, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
 - 1. Insulating Glass Certification Council (IGCC).
- F. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.
- G. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Install liquid sealants at ambient and substrate temperatures above 40 deg F.

1.9 WARRANTY

- A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturer of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate as defined in "Definitions" article, f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.
1. Warranty Period: Manufacturer's standard but not less than 10 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the products specified in Product Data Sheets at end of this Section.

2.2 PRIMARY FLOAT GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class as indicated below, and Quality q3 (glazing select).
1. Class 1 (clear) unless otherwise indicated.
- B. Provide Primary Clear Float Glass for Class 1 uncoated clear glass for monolithic glazing.

2.3 HEAT-TREATED FLOAT GLASS

- A. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.

1. Kind FT (fully tempered) where indicated.
- B. Manufacturers: Subject to compliance with requirements, provide heat-treated glass by one of the following companies.
1. AFG Industries, Inc.
 2. Glasstemp, Inc.
 3. Guardian Industries Corp.
 4. PPG Industries, Inc.
 5. Spectrum Glass Products, Inc.

2.4 WIRED GLASS

- A. Wired Glass: ASTM C 1036, Type II (glass, flat), Class 1 (clear), Quality q8 (glazing); 6.4 mm thick; of form and mesh pattern indicated below:
1. Polished Wired Glass: Form 1 (wired, polished both sides), and as follows:
 - a. Mesh m2 (square).
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering wired glass products that may be incorporated in the Work include, but are not limited to, the following companies.
- C. Manufacturers: Subject to compliance with requirements, provide wired glass by one of the following companies.
1. Polished Wired Glass:
 - a. Ashai Glass Co.
 - b. Central Glass Co., Ltd.
 - c. Nippon Sheet Glass Ltd.
 - d. Pilkington Sales (North America) Ltd.

2.5 INSULATING GLASS PRODUCTS

- A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated.
1. For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.
 2. Provide heat-treated, coated float glass of kind indicated or, if not otherwise indicated, Kind HS (heat strengthened) where recommended by manufacturer to comply with system performance requirements specified and Kind FT (fully tempered) where safety glass is designated or required.
 3. Performance characteristics designated for coated insulating glass are nominal values based on manufacturer's published test data for units with lites 6 mm thick and nominal 1/2-inch (13 mm) dehydrated space between lites, unless otherwise indicated.
 4. U-values are expressed as Btu/hr x sq. ft. x deg F (W/sq. m x K).
 5. Outdoor Lites: Class 1 (clear) float glass.

2.6 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).

2.8 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
- B. Clean cut or flat grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
 2. Presence and functioning of weep system.
 3. Minimum required face or edge clearances.
 4. Effective sealing between joints of glass-framing members.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass from edge damage during handling and installation as follows:
1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
 2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:
1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets

and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

END OF SECTION

SECTION 09 25 50 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Gypsum board assemblies attached to wood and metal framing.
 - 2. Non-load-bearing steel framing.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

- D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 3. Deflection and Firestop Track: Top runner provided in fire-resistance-rated assemblies indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Gypsum Board and Related Products:
 - a. Domtar Gypsum.
 - b. Georgia-Pacific Corp.
 - c. National Gypsum Co.; Gold Bond Building Products Division.
 - d. United States Gypsum Co.

2.2 STEEL PARTITION AND SOFFIT FRAMING

- A. Components, General: As follows:
1. Comply with ASTM C 754 for conditions indicated.
 2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with manufacturer's standard corrosion-resistant zinc coating.
- B. Steel Studs and Runners: ASTM C 645.
1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm), 0.027 inch (0.7 mm).
 2. Depth: As indicated, 3-5/8 inches (92.1 mm), 6 inches (152.4 mm), 4 inches (101.6 mm), 2-1/2 inches (63.5 mm), 1-5/8 inches (41.3 mm).
- C. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges.
- D. Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.
1. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Product: Subject to compliance with requirements, provide one of the following:
 - a. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
 - b. Metal-Lite, Inc.; Slotted Track.
- E. Proprietary Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Product: Subject to compliance with requirements, provide one of the following:
 - a. Fire Trak Corp.; Fire Trak.
 - b. Metal-Lite, Inc.; The System.
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
- G. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange.
1. Depth: 1-1/2 inches (38.1 mm).

2. Clip Angle: 1-1/2 by 1-1/2 inch (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.
- H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
 2. Depth: 7/8 inch (22.2 mm).
- I. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical or hat shaped, with face attached to single flange by a slotted leg (web) or attached to two flanges by slotted or expanded metal legs .
- J. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange.
1. Depth: 3/4 inch (19.1 mm).
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.
- L. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
1. Widths: Provide gypsum board in widths of 48 inches.
- B. Gypsum Wallboard: ASTM C 36 and as follows:
1. Type: Sag-resistant type for ceiling surfaces.
 2. Edges: Tapered.
 2. Thickness: As indicated.
- C. Proprietary Abuse-Resistant Gypsum Wallboard: ASTM C 36, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. National Gypsum Company; Gold Bond Hi-Abuse Wallboard.
 - b. United States Gypsum Co.; SHEETROCK Brand Abuse-Resistant Gypsum Panels.
3. Core: **5/8 inch (15.9 mm)**, Type X.
4. Long Edges: Tapered.
5. Location: As indicated.

2.4 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
 1. Material: Formed metal or plastic, with metal complying with the following requirement:
 - a. Steel sheet zinc coated by hot-dip process or rolled zinc.
 2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
 - a. Cornerbead on outside corners, unless otherwise indicated.
 - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
 - c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
 - d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
 - e. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.
- B. Accessory for Curved Edges: Cornerbead formed of metal, plastic, or metal combined with plastic, with either notched or flexible flanges that are bendable to curvature radius.
- C. Aluminum Accessories: Where indicated, provide manufacturer's standard extruded-aluminum accessories of profile indicated complying with the following requirements:
 1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of finish indicated and with not less than the strength and durability properties of aluminum extrusions complying with [ASTM B 221](#) for alloy and temper 6063-T5.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering aluminum accessories that may be incorporated in the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. MM Systems, Inc.

2.5 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
 - 1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Joint Tape for Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.
- D. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
 - 1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
 - 2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer.
 - 3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
 - 4. For topping compound, use sandable formulation.
- E. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
 - 1. Ready-Mixed Formulation: Factory-mixed product.
 - a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
 - b. Topping compound formulated for fill (second) and finish (third) coats.
- F. Joint Compound for Cementitious Backer Units: Material recommended by cementitious backer unit manufacturer.

2.6 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Steel drill screws complying with ASTM C 1002 for the following applications:
 - 1. Fastening gypsum board to wood framing.
- C. Gypsum Board Nails: ASTM C 514.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.

3.3 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than **1/16 inch** of open space between panels. Do not force into place.
- E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Instead, float gypsum panels over these members using resilient channels or provide control joints to counteract wood shrinkage.
- I. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over **32 inches** wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.
- J. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
- K. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
 - 1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft.** in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow **1/4- to 3/8-inch-** wide joints to install sealant.

- L. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- M. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- N. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
 - 1. Space screws a maximum of 12 inches o.c. for vertical applications.
- O. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.4 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
 - 1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistance-rated assemblies. Use maximum-length panels to minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 - b. At stairwells and other high walls, install panels horizontally.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- B. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:
 - 1. Install water-resistant gypsum backing board panels behind tile, and where indicated. Install with 1/4-inch open space where panels abut other construction or penetrations.
- C. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers prior to applying base layers on walls/partitions; apply gypsum wallboard face layers in same sequence. Offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints. Apply base layers at right angles to framing members, unless otherwise indicated.
- D. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and gypsum wallboard face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints. Stagger joints on opposite sides of partitions.
- E. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:
 - 1. Fasten with screws.
- F. Multilayer Fastening Methods: Apply base layers of gypsum panels and face layer to base layers as follows:
 - 1. Fasten both base layers and face layers separately to supports with screws.

- G. Direct-Bonding to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's recommendations, and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- H. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered over supports.
 - 1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 - 2. Fasten with corrosion-resistant screws.
- I. For curved partitions, install gypsum panels as follows:
 - 1. Select gypsum panel lengths and cut them as required to produce one unbroken panel covering each curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
 - 2. Wet gypsum panels on surfaces that will become compressed when panels are installed over a curve and where curve radius prevents using dry panels. Comply with gypsum board manufacturer's recommendations relative to curve radii, wetting methods, stacking panels after wetting, and other preparations that precede installing wetted gypsum panels.
 - 3. Apply gypsum panels horizontally with wrapped edges perpendicular to studs. On convex sides of partitions, begin installation at one end of curved surface and fasten gypsum panels to studs as they are wrapped around the curve. On concave side, start fastening panels to stud at center of curve and work outward to panel ends. Fasten panels to framing with screws spaced 12 inches o.c.
 - 4. For double-layer construction, apply gypsum board base layer horizontally and fasten to studs with screws spaced 16 inches o.c. Center gypsum board face layers over joints in base layer and fasten to studs with screws spaced 12 inches o.c.
 - 5. Allow wetted gypsum panels to dry before applying joint treatment.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
 - 1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - 2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
 - 3. Install U-bead where indicated.
 - 4. Install aluminum trim and other accessories where indicated.
- D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.6 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
- D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
 - 1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - 2. Level 2 where panels form substrates for tile and where indicated.
 - 3. Level 4 for gypsum board surfaces, unless otherwise indicated.
- E. Use the following joint compound combination as applicable to the finish levels specified:
 - 1. Embedding and First Coat: Setting-type joint compound. Fill (Second) Coat: Setting-type joint compound. Finish (Third) Coat: Sandable, setting-type joint compound.
- F. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
- G. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.
- H. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.
- I. Finish exterior gypsum soffit board using setting-type joint compounds to prefill joints and embed tape, and for first, fill (second), and finish (third) coats, with the last coat being a sandable product. Smooth each coat before joint compound hardens to minimize need for sanding. Sand between coats and after finish coat.
 - 1. Painting exterior gypsum soffit board after finish coat has dried is specified in another Division 9 Section.
- J. Base for Acoustical Tile: Where gypsum board is indicated as a base for adhesively applied acoustical tile, install joint tape and a 2-coat compound treatment, without sanding.
- K. Finish water-resistant gypsum backing board forming base for ceramic tile to comply with ASTM C 840 and gypsum board manufacturer's directions for treatment of joints behind tile.

3.7 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and report any deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
 - 1. Notify Architect one week in advance of the date and the time when the Project, or part of the Project, will be ready for an above-ceiling observation.

2. Prior to notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control air tubing.
 - f. Installation of ceiling support framing.

3.8 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 09 31 00 - PORCELAIN TILE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Unglazed porcelain tile.
 - 2. Wall tile.
 - 3. Special-purpose tile.
 - 4. Stone thresholds installed as part of tile installations.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
 - 2. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.6 Dry, Minimum 0.8 wet, at kitchen and shower areas.
- B. Load-Bearing Performance: For ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
 - 1. Heavy: Passes cycles 1 through 12.

1.5 SUBMITTALS

- A. Product Data: For each type of tile, mortar, grout, and other products specified.
- B. Shop Drawings: For the following:
 - 1. Tile patterns and locations.
 - 2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Tile Samples for Verification Only: Show colors, textures, and patterns available for each type of tile indicated. Include Samples of accessories involving color selection or verification.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.
- C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
 - 1. Stone thresholds.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

- C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 10 boxes for each field type, composition, color, pattern, and size indicated. Provide 5 boxes each of accent colors for wall and floor tile.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the ceramic tile installation schedules at the end of this Section.
- B. 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. Tile Products:
 - a. Crossville, Inc.
 - b. Florida Tile
 - c. American Olean
 - 2. Tile-Setting and -Grouting Materials: See Finish Schedule.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.

2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
- C. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

- A. Unglazed Porcelain Tile: Provide factory-mounted flat tile complying with the following requirements:
1. Composition: Porcelain with abrasive amixture.
 2. Module Size: 12 by 12 inches (50.8 by 50.8 mm).
 3. Nominal Thickness: ¼ inch (6.35 mm).
 4. Face: Plain with cushion edges.
- B. Wall Tile: Provide flat tile complying with the following requirements: See Finish Schedule .
- C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
 2. Shapes: As follows, selected from manufacturer's standard shapes:
 - a. Base for Thin-Set Mortar Installations: Coved.
 - b. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
 - c. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.
 - d. External Corners for Thin-Set Mortar Installations: Surface bullnose.
 - e. Internal Corners: Field-buttet square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

2.4 MARBLE THRESHOLDS

- A. General: Provide marble thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
1. Fabricate thresholds to heights indicated, but not more than 1/4 inch above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.
- B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for interior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.

1. Provide honed marble complying with the Marble Institute of America's Group A requirements for soundness. Color- Gray.

2.5 SETTING MATERIALS

- A. Dry-Set Portland Cement Mortar: ANSI A118.1.
 1. For wall applications, provide nonsagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.
- B. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
 1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
 - a. For wall applications, provide nonsagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.

2.6 GROUTING MATERIALS

- A. Dry-Set Grout: ANSI A118.6, color as indicated.
- B. Latex-Portland Cement Grout: ANSI A118.6 for materials described in Section H-2.4, composed as follows:
 1. Factory-Prepared, Dry-Grout Mixture: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to produce the following:
 - a. Unsanded grout mixture for joints **1/8 inch** and narrower.

2.7 MISCELLANEOUS MATERIALS

- A. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
 - 1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent adhesion or staining of exposed tile surfaces by grout, protect exposed surfaces of tile against adherence of mortar and grout by precoating them

with a continuous film of temporary protective coating indicated below, taking care not to coat unexposed tile surfaces:

1. Grout release.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
 1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 1. Locate joints in tile surfaces directly above joints in concrete substrates.
 2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
- H. Grout tile to comply with the requirements of the following tile installation standards:
 1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.
 2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

3.4 FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.
- B. Joint Widths: Install tile on floors with the following joint widths:
 - 1. Ceramic Tile and Special Purpose Tile: 3/8 inch.
- C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
- D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile. See Finish Notes for recommended type and finish.

3.5 WALL TILE INSTALLATION

- A. Install types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Joint Widths: Install tile on walls with the following joint widths:
 - 1. Wall Tile: 1/16 inch (1.6 mm).

3.6 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove latex-portland cement grout residue from tile as soon as possible.
 - 2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.
 - 1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work

- with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.7 PORCELAIN TILE FLOOR INSTALLATION SCHEDULE

- A. Porcelain Tile Floor Installation CFT-1 through CFT-2: Where interior floor installations of this designation are indicated, comply with the following:
1. Tile Type/Products: Unglazed ceramic tile. See Finish Schedule.
 2. Installation Method: TCA F113-98 (thin-set mortar bonded to concrete subfloor).
 3. Setting Bed and Grout: ANSI A108.5 with the following mortar and grout:
 - a. Dry-set portland cement mortar.
 - b. Latex-portland cement mortar.
 - c.. Dry-set grout.

3.8 PORCELAIN TILE WALL INSTALLATION SCHEDULE

- A. Porcelain Tile Wall Installation: Where interior wall installations are indicated, comply with the following:
1. Tile Type/Products: Glazed wall tile. Available products include the following: See Finish Schedule.
 2. Installation Method: TCA W202 (cement mortar bed bonded to clean, sound, dimensionally stable masonry).
 3. Setting Bed and Grout: ANSI A108.5 with the following grout:
 - a. Dry-set portland cement mortar.
 - b. Latex-portland cement mortar.
 - c. Dry-set grout.
 - d. Unsanded latex-portland cement grout.

END OF SECTION

SECTION 09 51 10 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes ceilings composed of acoustical panels and exposed suspension systems.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
- C. Samples for initial selection in the form of manufacturer's color charts consisting of actual acoustical panels or sections of panels and sections of suspension system members showing the full range of colors, textures, and patterns available for each ceiling assembly indicated.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
 - 1. Obtain both acoustical panels and suspension system from the same manufacturer.
- D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
 - 2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
 - 3. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of

Listed Products," or from the listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.

4. Products are identified with appropriate markings of applicable testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
 2. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, acoustical panels that may be incorporated in the Work include, but are not limited to, the following:
 1. General use Non-Fire-Resistance-Rated, Water-Felted, Mineral-Base Panels:

- a. Fine Fissured, High NRC (min 0.70), Square Lay-in, Humiguard Plus; Armstrong.
- b. Products equal to above.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 1. Mounting Method for Measuring Noise Reduction Coefficient (NRC): Type E-400 [plenum mounting in which face of test specimen is 15-3/4 inches away from the test surface] per ASTM E 795.
 2. Test Method for Ceiling Attenuation Class (CAC): Where acoustical panel ceilings are specified to have a CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 1. Where appearance characteristics of acoustical panels are indicated by reference to ASTM E 1264 pattern designations and not to manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 NON-FIRE-RESISTANCE-RATED, DIRECT-HUNG SUSPENSION SYSTEMS

- A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from prepainted or electrolytic zinc-coated, cold-rolled steel sheet or aluminum, with prefinished 15/16-inch- wide metal caps on flanges; other characteristics as follows:
 1. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
 2. Cap Material and Finish: Steel sheet painted to match color indicated by manufacturer's standard color designations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
- B. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
 2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. In the manner indicated on reflected ceiling plans.
 2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

3. Paint the cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended for this purpose by acoustical panel manufacturer.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 10 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Vinyl composition floor tile.
 - 2. Resilient wall base and accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Samples for Verification: Full size tiles of each color.
 - 1. For resilient accessories: Manufacturer's standard size samples of each accessory color and pattern.
- C. Product Certificates: Signed by manufacturers of resilient products certifying that each product furnished complies with requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.
- B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
 - 2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F.
- C. Store tiles on flat surfaces.
- D. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

- A. Maintain a temperature of not less than 70 deg F or more than 95 deg F in spaces to receive products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F or more than 95 deg F.
- B. Do not install products until they are at the same temperature as the space where they are to be installed.
- C. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.
- D. Install tiles and accessories after other finishing operations, including painting, have been completed.
- E. Where demountable partitions and other items are indicated for installation on top of resilient tile flooring, install tile before these items are installed.
- F. Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Furnish not less than 5 boxes of each field and border color of resilient tile installed.
 - 2. Furnish not less than 2 boxes of each accent color tile used.
 - 3. Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient accessory installed.

4. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Resilient Tile Flooring Schedule at the end of Part 3.

2.2 RESILIENT TILE

- A. Vinyl Composition Floor Tile: Products complying with ASTM F 1066 and with requirements specified in the Resilient Tile Flooring Schedule.

2.3 RESILIENT ACCESSORIES

- A. Rubber Wall Base: Products complying with FS SS-W-40, Type I and with requirements specified in the Resilient Tile Flooring Schedule.
- B. Vinyl Accessory Moldings: Products complying with requirements specified in the Resilient Tile Flooring Schedule.

2.4 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
- C. Vinyl Edge Strips: Vinyl of width shown, of height required to protect exposed edge of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified.

- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by flooring manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving resilient flooring.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with resilient product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

- A. General: Comply with tile manufacturer's written installation instructions.
- B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half of a tile at perimeter.
 - 1. Lay tiles square with room axis, unless otherwise indicated.
- C. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles in basket-weave pattern with grain direction alternating in adjacent tiles.
 - 2. Lay tiles in pattern of colors and sizes indicated on Drawings.
- D. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures, including existing glazed tile base, built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

- E. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install tiles on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- H. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to comply with tile manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
 - 1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Hand roll tiles according to tile manufacturer's written instructions.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. General: Install resilient accessories according to manufacturer's written installation instructions.
- B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
 - 1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
 - 2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 3. Do not stretch base during installation.
 - 4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 - 5. Except at wood resilient floors, form outside corners on job from straight pieces of maximum lengths possible, without whitening at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness. Provide manufacturers outside corners at resilient wood floors as specified.
 - 6. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.
- C. Place resilient accessories so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

- D. Apply resilient products to stairs as indicated and according to manufacturer's written installation instructions.

3.5 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing resilient products:
1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
 2. Sweep or vacuum floor thoroughly.
 3. Do not wash floor until after time period recommended by flooring manufacturer.
 4. Damp-mop floor to remove marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.
1. Leave tile damp mopped and ready to receive wax to be applied by the Owner.
 2. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- C. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

3.6 RESILIENT TILE FLOORING SCHEDULE

- A. Vinyl Composition Tile VCT: Where this designation is indicated, provide vinyl composition floor tile complying with the following:
1. Available Products: As follows: See Finish Schedule.
 2. Color and Pattern: As specified by product designation indicated above.
 3. Class: Class 2 (through-pattern tile).
 4. Wearing Surface: Smooth
 5. Thickness: 1/8 inch.
 6. Size: 12 by 12 inches
- B. Rubber Wall Base RB: Where this designation is indicated, provide rubber wall base complying with the following:
1. Available Products: See Finish Schedule
 2. Color and Pattern: As specified by product designation indicated above.
 3. Style: Cove with top-set toe.
 4. Minimum Thickness: 1/8 inch.
 5. Height: 4 inches.
 6. Lengths: Coils in lengths standard with manufacturer, but not less than 96 feet.
 7. Outside Corners: Pre-formed.
 8. Inside Corners: Pre-formed.

9. Ends: Premolded.
10. Surface: Smooth.

C. Vinyl Accessory Molding: Where this designation is indicated, provide vinyl accessory molding complying with the following: See Finish Notes.

1. Available Products: See Finish Notes.
2. Color: See Finish Notes.
3. Product Description: Tile and carpet joiner.
4. Profile and Dimensions: As indicated.

END OF SECTION

SECTION 09 90 00 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed interior items and surfaces.
 - 2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment. This includes all rooftop items.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Acoustical wall panels.
 - b. Solid toilet enclosures.
 - c. Metal lockers.
 - d. Kitchen equipment.
 - e. Elevator entrance doors and frames.
 - f. Elevator equipment.
 - g. Finished mechanical and electrical equipment.
 - h. Light fixtures.
 - i. Distribution cabinets.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.

- b. Ceiling plenums.
 - c. Pipe spaces.
 - d. Duct shafts.
 - e. Elevator shafts.
3. Finished metal surfaces include the following:
- a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze and brass.
4. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
- 1. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
 - 2. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
 - 3. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.

1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
- 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
- C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
- 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Submit Samples on the following substrates for the Architect's review of color and texture only:
 - a. Painted Wood: Provide two 12-inch- (300-mm-) square samples of each color and material on hardboard.

- b. Stained or Natural Wood: Provide two 4-by-8-inch (100-by-200-mm) samples of natural- or stained-wood finish on actual wood surfaces.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
 1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m) of wall surface.
 - b. Small Areas and Items: The Architect will designate an item or area as required.
 2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.
 3. Final approval of colors will be from job-applied samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
 - 1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.785 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include those listed in finish schedule or equal products by one of the following manufacturers:
 - 1. Devoe & Raynolds Co. (Devoe).
 - 3. Glidden Co. (The) (Glidden).
 - 4. Benjamin Moore & Co. (Moore).
 - 5. PPG Industries, Inc. (PPG).
 - 6. Pratt & Lambert, Inc. (P & L).
 - 7. Sherwin-Williams Co. (S-W).
 - 8. Duron Paints & Wallcoverings (Duron).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: See Finish Schedule. In the absence of a color schedule, up to 3 colors may be used on the interior and 3 different colors may be used on the exterior without increases in cost.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.

2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. When transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances including loose or flaking paint. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 1. Blast steel surfaces clean as recommended by paint system manufacturer and according to **SSPC-SP 6/NACE No. 3**.
 2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 3. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods. Clean prepainted galvanized metal surfaces; remove oil, grease, dirt, loose mill scale, and other foreign substances including loose or flaking paint. Existing sound paint shall not be removed. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 1. Blast steel surfaces clean as recommended by paint system manufacturer and according to **SSPC-SP 6/NACE No. 3**.

2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 3. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a

- smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
- F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- I. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.
- J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items. **Exterior doors and frames are to have alkyd-enamel finish as specified under INTERIOR PAINT SCHEDULE.**
 - 1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).
 - 1) Devoe: 13101 Mirrolac Rust Penetrating Metal Primer.
 - 2) Fuller: 621-04 Blox-Rust Alkyd Metal Primer.
 - 3) Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
 - 4) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
 - 5) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
 - 6) P & L: S/D 1009 Suprime "9" Interior/Exterior Alkyd Metal Primer.
 - b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

- 1) Devoe: 17XX Wonder-Shield Semi-Gloss Exterior Acrylic Latex House and Trim Paint.
- 2) Fuller: 664-XX Weather King II Semi-Gloss House & Trim Paint.
- 3) Glidden: 6600 Series Spred Ultra Exterior Gloss Latex House & Trim Paint.
- 4) Moore: MoorGlo Latex House & Trim Paint #096.
- 5) PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House and Trim Paint.
- 6) P & L: Z/F 3100 Series Aqua Royal Latex House & Trim Finish.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:

1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a galvanized metal primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **1.2 mils (0.031 mm)**.

- 1) Devoe: 8502/8520 Mirrolac-WB Interior/Exterior Waterborne Flat DTM Primer and Finish.
- 2) Fuller: 621-05 Blox-Rust Latex Metal Primer.
- 3) Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
- 4) Moore: IronClad Galvanized Metal Latex Primer #155.
- 5) PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
- 6) P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.

- b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than **2.6 mils (0.066 mm)**.

- 1) Devoe: 17XX Wonder-Shield Semi-Gloss Exterior Acrylic Latex House and Trim Paint.
- 2) Fuller: 664-XX Weather King II Semi-Gloss House & Trim Paint.
- 3) Glidden: 6600 Series Spred Ultra Exterior Gloss Latex House & Trim Paint.
- 4) Moore: MoorGlo Latex House & Trim Paint #096.
- 5) PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House and Trim Paint.
- 6) P & L: Z/F 3100 Series Aqua Royal Latex House & Trim Finish.

3.8 INTERIOR PAINT SCHEDULE

A. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units:

1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a block filler.
 - a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils (0.13 mm).
 - 1) Devoe: 52902 Bloxfil 200 Interior/Exterior Latex Block Filler.
 - 2) Fuller: 280-00 Interior/Exterior Latex Block Filler.
 - 3) Glidden: 5317 Ultra-Hide Block Filler, Latex Interior-Exterior.
 - 4) Moore: Moorcraft Interior & Exterior Block Filler #173.
 - 5) PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.
 - 6) P & L: Z 98 Pro-Hide Plus Latex Block Filler.
 - b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
 - 1) Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
 - 2) Fuller: 214-XX AA Enamel Interior Acrylic Latex Semi-Gloss Enamel.
 - 3) Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
 - 4) Moore: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
 - 5) PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.
 - 6) P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.

B. Gypsum Board or Plaster: Provide the following finish systems over interior gypsum board or plaster surfaces:

1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - 1) Devoe: 50801 Wonder-Tones Interior Vinyl Latex Primer-Sealer.
 - 2) Fuller: 220-20 Pro-Tech Latex Wall Primer Sealer, White.
 - 3) Glidden: 5111 Spred Ultra Latex Primer-Sealer.

- 4) Moore: Regal First Coat Interior Latex Primer & Underbody #216.
 - 5) PPG: 17-10 Quick-Drying Interior Latex Primer-Sealer.
 - 6) P & L: Z/F 1001 Suprime "1" 100 Percent Acrylic Multi-Purpose Primer.
- b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
- 1) Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
 - 2) Fuller: 214-XX AA Enamel Interior Acrylic Latex Semi-Gloss Enamel.
 - 3) Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
 - 4) Moore: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
 - 5) PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.
 - 6) P & L: Z/F 4100 Series Accolade Interior Semi-Gloss.
- C. Woodwork and Hardboard: Provide the following paint finish systems over new, interior wood surfaces:
1. Semigloss, Alkyd-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Alkyd or latex-based, interior enamel undercoater applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - 1) Devoe: 51701 Wonder-Prime All-Purpose Latex Primer Sealer & Vapor Barrier.
 - 2) Fuller: 220-07 Interior Alkyd Enamel Undercoat.
 - 3) Glidden: UH 400 Ultra-Hide Alkyd Interior Enamel Undercoater.
 - 4) Moore: Moore's Alkyd Enamel Underbody #217.
 - 5) PPG: 17-255 Quick-Drying Enamel Undercoater.
 - 6) P & L: S/D 1011 Suprime "11" Interior Alkyd Wood Primer.
 - 7) S-W: ProMar 200 Alkyd Enamel Undercoater B49W200.
 - b. First and Second Coats: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
 - 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.

- 2) Fuller: 110-XX Fullerglo Alkyd Semi-Gloss Enamel.
- 3) Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
- 4) Moore: Satin Impervo #235.
- 5) PPG: 27 Line Wallhide Low Odor Interior Enamel Wall and Trim Semi-Gloss Oil.
- 6) P & L: S/D 5700 Cellu-Tone Alkyd Satin Enamel.
- 7) S-W: Classic 99 Interior Alkyd Semi-Gloss Enamel A-40 Series.

D. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Semigloss, Alkyd-Enamel Finish: One finish coat over an enamel undercoater and a primer.
 - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).
 - 1) Devoe: 13101 Mirrolac Rust Penetrating Metal Primer.
 - 2) Fuller: 621-04 Blox-Rust Alkyd Metal Primer.
 - 3) Glidden: 5207 Glid-Guard Tank & Structural Primer, White.
 - 4) Moore: IronClad Retardo Rust-Inhibitive Paint #163.
 - 5) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
 - 6) P & L: S 4551 Tech-Gard High Performance Rust Inhibitor Primer.
 - 7) S-W: Kem Kromik Metal Primer B50N2/B50W1.
 - b. Undercoat: Alkyd, interior enamel undercoat or semigloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Fuller: 220-07 Interior Alkyd Enamel Undercoat.
 - 3) Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
 - 4) Moore: Moore's Alkyd Enamel Underbody #217.
 - 5) PPG: 6-6 Speedhide Interior Quick-Drying Enamel Undercoater.
 - 6) P & L: S/D 1011 Suprime "11" Interior Alkyd Wood Primer.
 - 7) S-W: ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200.

- c. Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
- 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Fuller: 110-XX Fullerglo Alkyd Semi-Gloss Enamel.
 - 3) Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
 - 4) Moore: Satin Impervo #235.
 - 5) PPG: 27 Line Wallhide Low Odor Interior Enamel Wall and Trim Semi-Gloss Oil.
 - 6) P & L: S/D 5700 Cellu-Tone Alkyd Satin Enamel.
 - 7) S-W: Classic 99 Interior/Exterior Semi-Gloss Alkyd Enamel A-40 Series.

E. Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal:

1. Semigloss, Alkyd-Enamel Finish: One finish coat over an undercoat and a primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - 1) Devoe: 13201 Mirrolac Galvanized Metal Primer.
 - 2) Fuller: 621-05 Blox-Rust Latex Metal Primer.
 - 3) Glidden: 5207 Glid-Guard Tank & Structural Primer, White.
 - 4) Moore: IronClad Galvanized Metal Latex Primer #155.
 - 5) PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
 - 6) P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.
 - 7) S-W: Galvite Paint B50W3.
 - b. Undercoat: Alkyd, interior enamel undercoat or semigloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
 - 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Fuller: 220-07 Interior Alkyd Enamel Undercoat.
 - 3) Glidden: UH 8400 Series Spred Ultra Traditional Alkyd Semi-Gloss Enamel.
 - 4) Moore: Moore's Alkyd Enamel Underbody #217.
 - 5) PPG: 6-6 Speedhide Interior Quick-Drying Enamel Undercoater.

- 6) P & L: S/D 1011 Suprime "11" Interior Alkyd Wood Primer.
 - 7) S-W: ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200.
- c. Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
- 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Fuller: 110-XX Fullerglo Alkyd Semi-Gloss Enamel.
 - 3) Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
 - 4) Moore: Satin Impervo #235.
 - 5) PPG: 27 Line Wallhide Low Odor Interior Enamel Wall and Trim Semi-Gloss Oil.
 - 6) P & L: S/D 5700 Cellu-Tone Alkyd Satin Enamel.
 - 7) S-W: Classic 99 Interior Alkyd Semi-Gloss Enamel A-40 Series.

3.9 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

- A. Stain-Varnish Finish: Two finish coats of varnish over a sealer coat and interior wood stain. Wipe wood filler before applying stain.
- 1. Filler Coat: Open-grain wood filler.
 - 2. Stain Coat: Interior wood stain.
 - 3. Sealer Coat: Clear sanding sealer.
 - 4. Finish Coats: Interior alkyd- or polyurethane-based clear satin varnish.

END OF SECTION

SECTION 10 15 50 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes toilet compartments and screens as follows:
 - 1. Type: Solid-plastic, H.D.P.E.
 - 2. Compartment Style: Overhead braced and floor anchored.
 - 3. Urinal Screen Style: Overhead braced and Floor anchored.
- B. Related Sections include the following:
 - 1. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, and similar accessories.

1.3 SUBMITTALS

- A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 WARRANTY

- A. Provide a manufacturer's 25 year guarantee against breakage, delamination, and corrosion of doors, panels, and pilasters.

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 the following:
 - 1. Scranton Products or equal

2.2 MATERIALS

- A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.
- B. Solid-Plastic: Solid polymer plastic, HDPE, high density polyethelene. Provide units with eased edges and with minimum 1-inch- thick doors and pilasters and minimum 1-inch- thick panels and screens.
 - 1. Color: One color in each room as selected by Architect from manufacturer's full range of colors.
- C. Pilaster Shoes and Sleeves (Caps): HDPE Solid Plastic
- D. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:
 - 1. Material: HDPE Solid Plastic.
- E. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
 - 1. Material: Stainless steel or heavy aluminum extrusion (6364-T5 alloy) with clear anodized finish.
- F. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish. Extend over toilet partitions, urinal screens and provide returns to wall over end partitions or screens for stability.
- G. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.

- H. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
- B. Solid-Plastic, Polymer-Resin Compartments and Screens: Provide aluminum heat-sink strips at exposed bottom edges of HDPE units to prevent burning.
- C. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- D. Floor-Anchored Screens: Provide pilasters and panels of same construction and finish as toilet compartments. Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- E. Doors: Unless otherwise indicated, provide **24-inch- (610-mm-)** wide in-swinging doors for standard toilet compartments and **36-inch- (914-mm-)** wide out-swinging doors with a minimum **32-inch- (813-mm-)** wide clear opening for compartments indicated to be handicapped accessible.
1. Hinges: Manufacturer's standard thru-bolted wrap hinge that can be adjusted to hold door open at any angle up to 90 degrees.
 2. Latch and Keeper: Recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
 3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
 5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than **1/2 inch** between pilasters and panels and not more than **1 inch** between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
- B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 10 42 50 - SIGNS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following types of signs:
 - 1. Restroom Panel signs.
 - 2. Room signs.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 15 Section "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
 - 2. Division 16 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
 - 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
 - 3. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for initial selection of color, pattern, and texture:
 - a. Cast Acrylic Sheet and Plastic Laminate: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.

1.4 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Manufacturers of Restroom and Room Panel Signs:
 - a. ASI Sign Systems, Inc.
 - b. Mohawk Sign Systems.
 - c. The Supersine Company.
 - d. Best Sign Systems.

2.2 MATERIALS

- A. Plastic Laminate: Provide high-pressure plastic laminate engraving stock with face and core plies in contrasting colors, in finishes and color combinations indicated or, if not indicated, as selected from the manufacturer's standards.
- B. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 ROOM PANEL SIGNS

- A. Room Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
 - 2. Provide 2 (two) Restroom Panel Signs.
with the following characteristics:
 - a. 12" x 12" square signs, 1/4" thick backplate.
 - b. Room name lettering shall be 1-1/2" and centered.
 - c. Restroom gender and ADA accessibility symbols size shall be 6".
 - d. Standard Grade 2 Braille shall be 1/2" below copy.
 - e. All restrooms shall contain gender symbols and ADA accessibility symbols followed by the verbal description (BOYS or GIRLS) and Grade 2 Braille.
 - 3. Provide 6 (six) Room Panel Signs.
with the following characteristics:
 - a. 12"x8" rectangular signs, 1/4" thick backplate.
 - b. Room name lettering shall be 1-1/2" and centered.
 - c. Standard Grade 2 Braille shall be 1/2" below copy.
 - d. One sign shall have 8" x 1" cutout open both ends and .030 lexan backplate and insert cover attached for changeable copy.
- B. Laminated Sign Panels: Permanently laminate face panels to backing sheets of material and thickness indicated using the manufacturer's standard process.
- C. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices.
- D. Raised Copy: Produce precisely formed characters with square cut edges free from burrs and cut marks.
 - 1. Raised Copy Thickness: Not less than 1/32 inch.

2.5 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
 - 1. Silicone-Adhesive and Stainless Steel Screw Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces **AND use four (4) stainless steel screws at each corner to secure to wall.**

3.2 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION

SECTION 10 52 20 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fire extinguishers.
 - 2. Fire extinguisher cabinets.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 15 Section " Sprinkler Systems" for fire protection systems.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
- C. Samples for initial selection purposes in the form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of cabinet finish indicated or exposed to view.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.
- B. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.
- C. FM-Listed Products: Fire extinguishers approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher with FM marking.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. J.L. Industries.
 2. Larsen's Manufacturing Co.
 3. Potter-Roemer, Inc.

2.2 FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.
- B. Multipurpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10-lb nominal capacity, in enameled steel container.

2.3 MOUNTING BRACKETS

- A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.
1. Provide brackets for extinguishers not located in cabinets and extinguishers located in cabinets.

2.4 CABINETS

- A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
- B. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where it is installed.
- C. Cabinet Type: Suitable for containing the following:
1. Fire extinguisher.
- D. Cabinet Mounting: Suitable for the following mounting conditions:
1. Semirecessed: Cabinet box (tub) partially recessed in walls of shallow depth.

- E. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.
 - 1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - a. Rolled-edge trim with 4-inch backbend depth.
 - b. Trim Metal: Of same metal and finish as door.
- F. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
 - 1. Stainless Steel: Manufacturer's standard door construction, fabricated from austenitic stainless steel complying with ASTM A 167, for AISI Type 302/304 alloy.
 - 2. Door Glazing: Clear float glass complying with ASTM C 1036, Type I, Class 1, Quality q3.
- G. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.
 - 1. Application Process: Silk screen.
- H. Door Style: Manufacturer's standard design.
 - 1. Vertical Duo Panel: Float glass, 1/8 inch thick.
- I. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either flush lever handle with cam-action latch, or flush exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

2.5 FINISHES FOR CABINETS, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

2.6 STAINLESS STEEL CABINET FINISHES

- A. Remove or blend tool and die marks and stretch lines into finish.
- B. Grind and polish surfaces to produce uniform-directional, textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
 - 1. Satin, Directional Polish: AISI No. 6 finish.
- C. Passivate and rinse surfaces after polishing. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine rough-in for cabinets to verify locations of piping connections prior to cabinet installation.
- B. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Follow manufacturer's printed instructions for installation.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.
 - 1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 2. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION

SECTION 10 53 00 - PROTECTIVE COVERS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK:

- A. Extent of the canopies required is shown on the drawings. Included herein, but not limited to, are:
 - 1. Decking
 - 2. Fascia/Gutter
 - 3. Anchors
 - 4. Columns
 - 5. Beams

1.02 MEASUREMENTS:

- A. Verify all dimensions shown on drawings by taking field measurements to insure proper fit and attachment of all component parts.

1.03 SUBMITTALS:

- A. Provide manufacturer's shop drawings, including fabrication and installation details.

1.04 COORDINATION:

- A. Provide necessary anchors, flashing and other items required to be built-in in ample time to avoid delays to the job.

1.05 DELIVERY AND STORAGE:

- A. Deliver and store all items in protected areas. Keep free of any damage. Replace any damaged items or parts at no cost to the Owner.

1.06 DESIGN PARAMETERS:

- A. Live load of the canopies shall be no less than "20 p.s.f.". Canopies shall comply in all respects with "**2012 & 2018 International Building Code**" requirements for Floor, Wall and Roof Systems.
- B. Provide engineered shop drawings for the canopy framing, decking and foundations stamped by a licensed professional engineer in the State of Tennessee to the Architect for approval. Indicate compliance with both the 2012 and the 2018 editions of the International Building Code on the shop drawings.**

PART 2 - MATERIALS AND PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Subject to compliance with requirements herein, provide product manufactured by Superior Metal Products Company, Inc., Birmingham, Alabama or equal.

2.02 PRODUCTS AND MATERIALS:

- A. *Decking*: Decking panels shall be extruded aluminum Econo Decking.
- B. *Fascia/Gutter*: Full perimeter extruded aluminum fascia/gutter shall be 7" x 4".
- C. *Canopy Columns*: Extruded aluminum canopy columns shall be 4" x 4".
- D. *Canopy Beams*: Extruded aluminum C-Beams come in 10" x 3" and 8" x 4" sizes. Extruded aluminum drain beams are offered in 6" x 4" and 6" x 3". Provide sizes as required
- E. *Heavy Duty Overhead Supports*: Fabricated from .125 wall aluminum tubing for all wall attached canopies.
- F. *Finishes*: All above components shall have a clear anodized finish.

PART 3 - INSTALLATION AND ERECTION

3.01 ERECTION:

- A. *Drainage*: Walkway canopies shall drain internally, from fascia/gutter to columns, and be discharged at or near finished grade level. Cantilevered canopies shall be down spouted from fascia/gutter to columns via a 6" x 3" extruded aluminum drain beams and shall discharge at or near finished grade level. Canopies with projections less than 10'0" shall have a minimum of 1/8" per foot pitch and those with projections 10'0" and greater shall have a minimum pitch of 1/4" per foot.
- B. *General*: Canopies shall be installed according to approved plans and shop drawings and the entire structure shall be erected straight, true and plumb in accordance with standard construction procedures. All joints and connections will be tight and clean and all surfaces of work left in a clean condition.
- C. *Foundations*: Provide concrete footings as required at each column as designed by the licensed structural engineer for the canopy design.
- D. *Components*: Provide all components to form a complete installation with all trim, flashings, fascias, gutters and fasteners as required by the manufacturer.

END OF SECTION

SECTION 10 80 00 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes toilet and bath accessory items as scheduled.
- B. Installation of Owner supplied accessories.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.
- B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.
- C. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.
- D. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.
- E. Maintenance instructions including replaceable parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.
- B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

1.5 PROJECT CONDITIONS

- A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.6 WARRANTY

- A. Warranty Period: 15 years from date of Substantial Completion.
- B. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include, but are not limited to, the following:
 - 1. A & J Washroom Accessories.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. McKinney/Parker.

2.2 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034 inch (0.9 mm) minimum thickness.
- B. Mirror Glass: Nominal 6.0 mm thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.
- C. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 TOILET TISSUE DISPENSERS

- A. Furnished by Owner.

2.4 TOWEL DISPENSER

- A. Furnished by Owner.

2.5 SOAP DISPENSERS

- A. Furnished by Owner.

2.6 GRAB BARS

- A. Stainless Steel Type-Equal to ASI 3500 Series: Provide grab bars with wall thickness not less than 0.05 inch (1.3 mm) and as follows:
 1. Mounting: Exposed, manufacturer's standard flanges and anchorages.
 2. Clearance: 1-1/2 inch (38 mm) clearance between wall surface and inside face of bar.
 3. Gripping Surfaces: Manufacturer's standard nonslip texture.
 4. Heavy-Duty Size: Outside diameter of 1-1/2 inches (38 mm).
 5. Sizes and configurations: As indicated on drawings.

2.7 MIRROR UNITS

- A. Stainless Steel Framed Glass Mirror Units-Equal to ASI 0600 Series: Fabricate frame with angle shapes not less than 0.05 inch (1.3 mm), with square corners mitered, welded, and ground smooth. Provide in sizes as indicated on drawings.

2.8 FABRICATION

- A. General: No names or labels are permitted on exposed faces of toilet and bath accessory units. On either interior surface not exposed to view or on back surface, provide identification of each accessory item either by a printed, waterproof label or a stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:

1. Provide galvanized-steel backing sheet, not less than **0.034 inch (0.9 mm)** and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- E. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theftproof installation, as follows:
1. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install toilet accessory units including Owner provided units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
- C. Install grab bars to withstand a downward load of at least **250 lbf (1100 N)**, complying with ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION

SECTION 11 49 00 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following gymnasium equipment:
 - 1. Basketball equipment.
 - 2. Volleyball equipment.
 - 3. Wall-mounted and post column safety pads.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for installation of floor insert sleeves to be cast in concrete subfloors and footings.
 - 2. Division 5 Section "Structural Steel" for structural supports not provided by gymnasium equipment manufacturer for supporting gymnasium equipment to building structure.
 - 3. Division 16 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized gymnasium equipment.
- C. Products furnished, but not installed under this Section, include floor insert sleeves for inserts to be cast in concrete subfloors and footings.

1.3 DEFINITIONS

- A. NCAA: National Collegiate Athletic Association.
- B. NFHS: National Federation of State High School Associations.
- C. USAV: United States of America Volleyball (formerly, USVBA: U.S. Volleyball Association).

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Provide basketball backstops capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads," whichever is more stringent.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, features, and finishes. Include details of anchors, hardware, and fastenings. If applicable, include assembly, disassembly, and storage instructions.
1. Gymnasium Equipment Operators: Include operating instructions.
 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Show location and extent of fully assembled gymnasium equipment. Show location and extent of disassembled equipment and components and transport and storage accessories. Include elevations, sections, and details not shown in Product Data. Show method of field assembly, connections, installation details, mountings, floor inserts, attachments to other Work, operational clearances, and relationship to adjoining work.
1. Blocking and Reinforcement: Show locations of blocking and reinforcement required for support of gymnasium equipment.
 2. Setting Drawings: For cast-in floor insert sleeves for post standards.
 3. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for supporting gymnasium equipment and for seismic restraint. Verify capacity of members and connections to support loads and verify loads, point reactions, and locations for attachment of gymnasium equipment to structure with those indicated on Drawings.
 4. Gymnasium Equipment Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 5. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Court layout plans and elevations drawn to scale and coordinating floor-insert penetrations and game lines and markers applied to finished flooring.
- D. Samples for Initial Selection: For each type of gymnasium equipment indicated.
- E. Samples for Verification: For the following products:
1. Pad Fabric: Not less than 3 inches square, with specified treatments applied. Mark face of material.
- F. Maintenance Data: For gymnasium equipment and gymnasium equipment operator to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer employing workers trained and approved by the manufacturer.

- B. Source Limitations: Obtain each type of gymnasium equipment through one source from a single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment. Verify dimensions by field measurements.

1.8 COORDINATION

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Basketball Equipment:
 - a. AALCO.
 - b. AL, Inc.; ADP Lemco, Inc.
 - c. Basketball Products International; American Athletic, Inc.
 - d. Bison Inc.
 - e. Institutional Products, Inc.
 - f. Jaypro Sports, Inc.
 - g. Performance Sports Systems, Inc.
 - h. Porter Athletic Equipment Co.

2. Volleyball Equipment:
 - a. AALCO.
 - b. American Athletic, Inc.
 - c. Bison Inc.
 - d. Jaypro Sports, Inc.
 - e. Performance Sports Systems, Inc.
 - f. Porter Athletic Equipment Co.
 - g. Schelde North America.
 - h. Sports Imports, Inc.

3. Wall-Mounted and Post Column Safety Pads:
 - a. AALCO.
 - b. AL, Inc.; ADP Lemco, Inc.
 - c. American Athletic, Inc.
 - d. Draper Shade & Screen Co., Inc.
 - e. Institutional Products, Inc.
 - f. Jaypro Sports, Inc.
 - g. Performance Sports Systems, Inc.
 - h. Porter Athletic Equipment Co.

2.2 MATERIALS, GENERAL

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; mill finish or decorative, baked-enamel, powder-coat finish.
 1. Extruded Bars, Profiles, and Tubes: ASTM B 221.
 2. Cast Aluminum: ASTM B 179.

- B. Steel: Comply with the following:
 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, hot-dip galvanized.
 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53.
 3. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless another grade is required by structural loads.
 4. Steel Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513 or steel tubing fabricated from steel complying with ASTM A 569/A 569M and complying with the dimensional tolerances in ASTM A 500.
 5. Malleable-Iron Castings: ASTM A 47, grade required by structural loads.
 6. Support Cable: 1/4-inch- diameter, 7x19 galvanized steel aircraft cable with a breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written recommendations for size, number, and method of installation.
 7. Support Chain: Proof coil chain, complying with ASTM A 413/A 413M, Grade 30, size and diameter as required by structural loads; plated or painted. Provide fittings complying with chain manufacturer's written recommendations for size, number, and method of installation.

- C. Particleboard: ANSI A208.1.
- D. Wood-Based, Structural-Use Panels: Comply with DOC PS 2; for plywood, comply with DOC PS 1.
- E. Equipment Mounting Pads: Wood, neutral color painted finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's written recommendations.
- F. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed. Provide as required for gymnasium equipment assembly, mounting, and secure attachment.
- G. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

2.3 BASKETBALL EQUIPMENT

- A. General: Provide equipment complying with requirements in "NFHS Basketball Rule Book." Protruding fasteners or exposed bolt heads on front face of backboards are not permitted. See item J. for Alternate #2 Stationary Goals.
- B. Overhead-Supported Backstop (2 main goals): Complete assembly spanning height indicated on Drawings, including primary and secondary superstructure support framing to Pre-engineered building structure, pipe and cable bracing, adjustable hangers, clamps, cables, chains, pulleys, fittings, hardware, and fasteners.
 - 1. Framing: Steel trusses, pipe, tubing, and shapes. Design framing to minimize vibration during play.
 - a. Center Mast: Welded construction with side sway bracing of pipe.
 - b. Finish: Manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness; black.
 - 2. Folding Type: Provide manufacturer's standard assembly for forward-folding, front-braced or forward-folding, rear-braced backstop, with hardware and fittings to permit folding.
 - 3. Goal Height Adjuster: Adjustable from 8 to 10 feet with crank mechanism, locking in any position within adjustment range, with visible height scale and finish matching framing.
 - a. Operation: Manual with detachable crank handle.
- C. Backstop/Backboard Safety Device: Designed to limit free fall if support cable, support chain, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb load capacity; one per folding backstop.

1. Retractor Device: Manufacturer's standard device designed to retract both support and safety cables, chains, and straps away from play of the basketball when backstop is in playing position; one per folding backstop.
- D. Electric Operator: Provide factory-assembled electric operator for backstop designed for lifting and lowering basketball equipment of type, size, weight, construction, use, and operation frequency indicated. Provide operation system, of size and capacity and with features, characteristics, and accessories suitable for Project conditions, recommended by gymnasium equipment manufacturer; complete with winch or hoist designed to move and hold backstop in any raised or lowered position, electric motor and factory-rewired motor controls with limit controls, remote-control stations, remote-control devices, power disconnect switch, enclosures protecting controls and all operating parts, and accessories required for proper operation. Include wiring from motor controls to motor. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.
1. Comply with NFPA 70.
 2. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6.
 3. Winch: Consisting of heavy-duty, fully enclosed worm gear reducer, belt and sprocket drive, cable drum, cable, and fittings.
 4. Electric Motor: UL-approved or -recognized, totally enclosed, insulated, capacitor-start motor, complying with NEMA MG 1, with thermal-overload protection, brake, and permanently lubricated bearings; sized to start and operate size and weight of basketball equipment considering Project's service conditions without exceeding nameplate ratings or considering service factor.
 - a. Service Factor: According to NEMA MG 1, unless otherwise indicated.
 - b. Motor Characteristics: Single phase, sized by gymnasium equipment manufacturer, 115 V, 60 Hz.
 5. Operator Mounting: Wall, on equipment mounting pad.
 6. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting.
 - a. Control Stations: Keyed, momentary-contact, three-position, switch-operated control with up, down, and off functions; one switch per each backstop. Provide two keys per station.
 7. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.
- E. Basketball Backboard: Provide predrilled holes or preset inserts for mounting goals.
1. Description: Rectangular, 72 by 42 inches width by height, fabricated from the following:
 - a. Glass: Not less than 1/2-inch- thick, transparent tempered glass. Provide glass with impact-absorbing, resilient rubber or PVC gasket around perimeter in a fully welded painted steel frame, with steel subframe, reinforcement, and bracing, including center-strut frame reinforcement, and

with mounting slots for mounting backboard frame to backstop support framing.

- 1) Standard Mount: Provide steel corner reinforcement with mounting slots for mounting backboard frame to backstop support framing at standard mounting centers.
 - b. Steel: Single piece, steel face sheet, not less than 0.1046-inch nominal thickness, with 1-1/2-inch- deep, roll-edged perimeter flange and with steel-reinforced, welded frame welded to backside of backboard; with mounting slots for mounting backboard frame to backstop support framing at standard mounting centers.
 - c. Hardwood or Particleboard: Not less than 1-1/2-inch- thick backboard consisting of not less than 1/32-inch- thick, melamine- or phenolic-resin-impregnated cellulose and paper laminate over front and back sides of 1-1/2-inch hardwood or particleboard core; with painted edges and corners and with threaded inserts or slotted brackets for mounting backboard corners to backstop support framing at standard mounting centers.
 2. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.
 3. Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
- F. Goal Mounting Assembly: Compatible with goal, backboard, and support framing, with manufacturer's standard hole pattern for goal attachment.
1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass backboard.
- G. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
 2. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism including positive-lock, preset pressure release, set to release at 230-lb load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
 3. Mount: Front mount.
 4. Net Attachment: No-tie loops for attaching net to rim without tying.
 5. Finish: Manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness; orange.
- H. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit rim diameter, and as follows:
1. Competition Cord: Antiwhip, made from white nylon cord not less than 120 gm nor more than 144 gm thread.

- I. Safety Pads: Provide safety pads, complying with NCAA and NFHS, designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by referenced rules.
 - 1. Safety Pad Attachment: Manufacturer's standard.
 - 2. Color: Gray.
- J. **Stationary goals for Alternate #2-** Provide 2 stationary mounted goals & backboards with the following features:
 - 1. Fan fiberglass backboard with stationary wall mount structure.
 - 2. Goal with net.
 - 3. All steel pipes and cable bracing, wood mounting grounds, hangers, clamps, cables, chains, pulleys, fittings, hardware, and fasteners for wall mounting where indicated.

2.4 VOLLEYBALL EQUIPMENT

- A. General: Provide equipment complying with requirements in "NFHS Volleyball Rule Book."
- B. Floor Insert: Solid-brass floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than length required to securely anchor pipe sleeve in structural floor; with anchors designed for securing floor insert to floor substrate indicated; quantity as indicated on Drawings.
 - 1. Floor Plate: Manufacturer's standard hinged access cover, designed to be flush with adjacent flooring. Provide two tools for unlocking access covers.
- C. Standards & Net: Provide 2 Pole Standards and one net by same manufacturer as floor sleeves. Poles and nets shall be fully adjustable by winches and hand cranks.

2.5 WALL-MOUNTED AND POST COLUMN SAFETY PADS

- A. Safety Pad Surface-Burning Characteristics: Provide safety pads with flame-spread index of 25 or less and smoke-developed index of 450 or less, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Pad Covers: Provide safety pad fabric covers fabricated from puncture- and tear-resistant, not less than 14-oz. PVC-coated polyester or nylon-reinforced PVC fabric treated with fungicide for mildew resistance, with the fire-test-response characteristics indicated.
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- C. Column and Wall Safety Pads: Pads covering exposed flange of 6- to 8-inch- wide flange columns to height indicated and wall width as shown on drawings, consisting of not less than 1-1/4-inch- thick, multiple-impact-resistant, closed-cell polyethylene-foam

filler, covered both sides and all edges of pad by fabric cover with self-adhesive hook-and-loop attachment to exposed face of column.

1. Fabricate column covers custom made to fit each column where indicated.
2. Length: Each pad not less than 72 inches.
3. Fabric Cover Color: As selected by Architect from manufacturer's full range for one color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
 1. Verify critical dimensions.
 2. Examine supporting structure and below finished floor for subfloors and footings.
 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked for installers. Locate reinforcements and mark locations if not already done.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly, where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.
- C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
 1. Floor Insert Location: Coordinate location with application of game lines and markers.
 2. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Wall Column Safety Pads: Mount with bottom edge at 4 inches above finished floor.

- E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed gymnasium equipment to structural support and for properly transferring load to in-place construction.
- F. Connections: Connect automatic operators to building electrical system.
- G. Portable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble portable gymnasium equipment after assembled configuration has been approved by Architect, and store units in location indicated on Drawings.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING AND PROTECTION

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions acceptable to manufacturer and Installer that ensure gymnasium equipment is without damage or deterioration at time of Substantial Completion.
- C. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION

SECTION 13 12 50 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes metal building systems that consist of integrated sets of mutually dependent components including structural framing, roof panels, wall panels, and accessories.
- B. See Division 3 Section "Cast-in-Place Concrete" for concrete foundations, slabs, and anchor-bolt installation.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Engineer metal building systems according to procedures in MBMA's "Metal Building Systems Manual."
 - 2. Design Loads: As indicated on Drawings.
 - 3. The maximum deflection of the metal frame shall be H/200 inches.
- B. Seismic Performance: Design and engineer metal building systems capable of withstanding the effects of earthquake motions determined according to (see drawings).
- C. Thermal Movements: Provide metal panel systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- D. Thermal Performance: Provide insulated metal panel assemblies with the following maximum U-factors and minimum R-values for opaque elements when tested according to ASTM C 1363 or ASTM C 518:
 - 1. Metal Roof Panel Assemblies:
 - a. R-Value: 30
 - 2. Metal Wall Panel Assemblies:
 - a. R-Value: 25
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

1.3 SUBMITTALS

- A. Product Data: For each type of metal building system component indicated.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation. **Governing building code and year of edition- 2012 & 2018 International Building Code.**
 2. Anchor-Bolt Plans: Submit anchor-bolt plans before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
 3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 4. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
- C. Samples: For each type of building component and for each color and texture required.
- D. **Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:**
1. Name and location of Project.
 2. Order number.
 3. Name of manufacturer.
 4. Name of Contractor.
 5. Building dimensions including width, length, height, and roof slope.
 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 7. **Governing building code and year of edition- 2012 & 2018 International Building Code.**
 8. Design loads and load combinations.
 9. Building-use category.
 10. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.
- E. Welding certificates.
- F. Erector Certificate: Signed by manufacturer certifying that erector complies with requirements.
- G. Manufacturer certificate.
- H. Surveys: Show final elevations and locations of major members. Have surveyor who performed surveys certify their accuracy.

1.4 QUALITY ASSURANCE

- A. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- B. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.
 - 1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
 - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- D. Structural Steel: Comply with AISC's "Specification for Structural Steel Buildings-- Allowable Stress Design, Plastic Design," or AISC's "Load and Resistance Factor Design Specification for Structural Steel Buildings," for design requirements and allowable stresses.
- E. Cold-Formed Steel: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members," or AISI's "Load and Resistance Factor Design Specification for Steel Structural Members," for design requirements and allowable stresses.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness and with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

1.6 PROJECT CONDITIONS

- A. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.

1.7 COORDINATION

- A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- B. Coordinate installation of roof penetrations, which are specified in Division 7 Section "Roof Accessories."

1.8 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- B. Special Weather-tightness Warranty for roofing panels in base bid: Provide manufacturer's standard form for a minimum of 20 years against leaks in roof system, including trims, flashings, and penetrations arising from, or caused by, ordinary wear and tear under normal weather and atmospheric conditions. Coverage shall be No Dollar Limit (NDL) for full replacement value. Warranty shall be signed by both the metal roofing system Manufacturer and metal roofing system Contractor. Warranty shall cover both material and workmanship. **Any manufacturer unable to provide this warranty shall not be accepted, including those listed in 2.1, A.**
1. Weather-tightness Warranty Period: 20 years from date of Substantial Completion.

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. American Buildings Company.
 2. American Steel Building Company, Inc.; Division of NCI Building Systems, LLP.
 3. Butler Manufacturing Company.
 4. Ceco Building Systems; Division of Robertson-Ceco Corporation.
 5. Mesco Metal Buildings; Division of NCI Building Systems, LLP.
 6. Metallic Metal Building Company; Division of NCI Building Systems, LLP.
 7. Southern Structures, Inc.
 8. Spirco Manufacturing; Division of Metal Building Products, Inc.
 9. Star Building Systems; Division of Robertson-Ceco Corporation.
 10. Steelo Systems Inc.
 11. VP Buildings, Inc.; a United Dominion Company.

2.2 STRUCTURAL-FRAMING MATERIALS

- A. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.

- B. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
- C. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
- D. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low Alloy Steel (HSLAS), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or High-Strength Low Alloy Steel (HSLAS), Grades 45 through 70.
- E. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 or High-Strength Low Alloy Steel (HSLAS), Grades 50 through 80; with G60 coating designation; mill phosphatized.
- F. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
 - 1. Finish: Plain.
- G. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
 - 2. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with splined ends.
 - a. Finish: Plain.
- H. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563 hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436 hardened carbon steel.
 - 5. Finish: Plain.
- I. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Nuts: ASTM A 563 hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436 hardened carbon steel.
 - 4. Finish: Plain.
- J. Threaded Rods: ASTM A 193/A 193M.
 - 1. Nuts: ASTM A 563 hex carbon steel.
 - 2. Washers: ASTM F 436 hardened carbon steel.
 - 3. Finish: Plain.
- K. Primer: SSPC-Paint 15, Type I, red oxide.

2.3 MATERIALS FOR FIELD-ASSEMBLED METAL PANELS

- A. Metallic-Coated Steel Sheet Pre-painted with Coil Coating: Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80, with G90 coating designation.
 2. Surface: Smooth, flat finish.
 3. Exposed Finishes: Apply the following coil coating, as specified or indicated on Drawings:
 - a. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions, except as modified below:
 - 1) Humidity Resistance: 1000 hours.
 - 2) Salt-Spray Resistance: 1000 hours.
 - b. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored backer finish, consisting of prime coat and wash coat with a total minimum dry film thickness of 0.5 mil.

2.4 THERMAL INSULATION FOR FIELD-ASSEMBLED METAL PANELS

- A. See Section 07200.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
1. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.
 2. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with nylon or polypropylene washer.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

- D. Metal Panel Sealants:
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing.
 - 2. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant.

2.6 FABRICATION, GENERAL

- A. Tolerances: Comply with MBMA's "Metal Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances."
- B. Metal Panels: Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.7 STRUCTURAL FRAMING

- A. General:
 - 1. Primary Framing: Shop fabricate framing components to indicated size and section with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
 - a. Make shop connections by welding or by using high-strength bolts.
 - b. Join flanges to webs of built-up members by a continuous submerged arc-welding process.
 - c. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 - d. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary structural members with specified primer after fabrication.
 - 2. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
 - a. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary structural members with specified primer after fabrication.
- B. Primary Framing: Manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing. Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - 1. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.

2. Frame Configuration: Two-directional sloped.
 3. Exterior Column Type: Tapered.
 4. Rafter Type: Tapered.
- C. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0598 inch.
- D. Secondary Framing: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet prepainted with coil coating, unless otherwise indicated, to comply with the following:
1. Purlins: C- or Z-shaped sections; fabricated from minimum 0.0598-inch- thick steel sheet, built-up steel plates, or structural-steel shapes; minimum 2-1/2-inch-wide flanges.
 - a. Depth: As required to comply with system performance requirements.
 2. Girts: C- or Z-shaped sections; fabricated from minimum 0.0598-inch- thick steel sheet, built-up steel plates, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees to flange and with minimum 2-1/2-inch- wide flanges.
 - a. Depth: As required to comply with system performance requirements.
 3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from 0.0598-inch-thick steel sheet, built-up steel plates, or structural-steel shapes; to provide adequate backup for metal panels.
 4. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch diameter, cold-formed structural tubing to stiffen primary frame flanges.
 5. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
 6. Base or Sill Angles: Minimum 3-by-2-by-0.0598-inch zinc-coated (galvanized) steel sheet.
 7. Purlin and Girt Clips: Minimum 0.0598-inch- thick, steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
 8. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0598-inch- thick, structural-steel sheet.
 9. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch-thick, cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.
 10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- E. Bracing: Provide adjustable wind bracing as follows:
1. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
 2. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.

- F. Bolts: Provide plain finish bolts for structural-framing components that are primed or finish painted. Provide hot-dipped galvanized bolts for structural-framing components that are galvanized.
- G. Factory-Primed Finish: Apply specified primer immediately after cleaning and pretreating.
 - 1. Prime primary, secondary, and end-wall structural-framing members to a minimum dry film thickness of 1 mil.
 - a. Prime secondary steel framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.
 - 2. Prime galvanized members with specified primer, after phosphoric acid pretreatment.

2.8 METAL ROOF PANELS

- A. Vertical-Rib, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
 - 1. Material: Zinc-coated (galvanized) steel sheet, 0.0269 inch (0.70 mm) thick.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from zinc-coated (galvanized) steel sheet.
 - 3. Joint Type: Mechanically seamed, folded as standard with manufacturer.
 - 4. Panel Coverage: 16 inches (406 mm).
 - 5. Panel Height: 2 inches (51 mm).
 - 6. Warranty: Special 20-year manufacturer supported weathertight warranty on all roofing panels and components.

2.9 FIELD-ASSEMBLED METAL WALL PANELS

- A. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
 - 1. Material: Zinc-coated (galvanized) steel sheet, 0.0269 inch thick.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Major-Rib Spacing: 12 inches o.c.
 - 3. Panel Coverage: 36 inches.
 - 4. Panel Height: 1.5 inches.

2.10 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent

possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels, unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
 2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Formed from minimum 0.0159-inch- thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.
1. Opening Trim: Minimum 0.0269-inch- thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Gutters: Formed from minimum 0.0159-inch- thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
1. Gutter Supports: Fabricated from same material and finish as gutters; spaced 36 inches o.c.
- F. Downspouts: Formed from 0.0159-inch- thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters; spaced 10 feet o.c.

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform the following tests and inspections and to submit reports.
 - 1. Special inspections will not be required if fabrication is performed by a manufacturer registered and approved by authorities having jurisdiction to perform such Work without special inspection.
 - a. After fabrication, submit certificate of compliance with copy to authorities having jurisdiction certifying that Work was performed according to Contract requirements.
- B. Tests and Inspections:
 - 1. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 2. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1.

PART 3 - EXECUTION

3.1 ERECTION

- A. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with Erector present, for compliance with requirements and metal building system manufacturer's tolerances.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place, unless otherwise indicated.
- C. Erect metal building system according to manufacturer's written erection instructions and erection drawings.
- D. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- E. Set structural framing accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- F. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- G. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Level and plumb individual members of structure.
- H. Primary Framing and End Walls: Erect framing true to line, level, plumb, rigid, and secure. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist cure grout for not less than seven days after placement.
1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and snug-tightened or pretensioned joints.
- I. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts.
1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 2. Locate and space wall girts to suit openings such as doors and windows.
 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- J. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
1. Install portal frame bracing as indicated on architectural plan.
 2. Locate interior end-bay bracing only where indicated.
- K. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- L. Erection Tolerances: Maintain erection tolerances of structural framing within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.2 METAL PANEL INSTALLATION, GENERAL

- A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 2. Install metal panels perpendicular to structural supports, unless otherwise indicated.

3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 4. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 5. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- B. Lap-Seam Metal Panels: Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or metal panels. Install screws in predrilled holes. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal panel manufacturer.

3.3 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations. Install ridge caps as metal roof panel work proceeds.
- B. Field-Assembled, Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 3. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Pre-drill panels for fasteners.
 4. Provide metal closures at rake edges, rake walls and each side of ridge caps.
- C. Field-Assembled, Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
 2. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels; on side laps of ribbed or fluted metal panels; and elsewhere as needed to make metal panels weatherproof to driving rains.

3. At metal panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.4 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. When two rows of metal panels are required, lap panels 4 inches minimum.
 2. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
 3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
 4. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 5. Install screw fasteners in predrilled holes.
 6. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated, or if not indicated, as necessary for waterproofing.
 7. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws.
 8. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Field-Assembled, Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 2. Install components for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection.
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
1. Provide elbows at base of downspouts to direct water away from building.
 2. Tie downspouts to underground drainage system indicated.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform the following tests and inspections and to submit reports.
- B. Tests and Inspections:
1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1.

3.7 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning."
 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION

SECTION 22 01 01

PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, material, etc. required to complete installation specified herein and/or shown or scheduled on the drawings.
- B. Equipment and materials used in the work shall be in accordance with the contract documents, of the best quality and grade for the use intended, shall be new and unused and shall be the manufacturer's latest standard or current model for which replacement parts are readily available.
- C. All apparatus and equipment shall be installed and connected in accordance with the best engineering practices and in accordance with the manufacturer's recommendations. All auxiliary piping, water seals, valves, electrical connections, etc., recommended by the manufacturer or required for proper operation shall be furnished and installed complete.

1.2 SPECIAL CONDITIONS, PLUMBING:

- A. By the act of submitting a bid, this Contractor agrees that all of the "Contract Documents" and each of the Divisions of the complete specifications have been reviewed and studied, and all requirements and coordination resulting there from are included.
- B. In this section, the word "Contractor" means the Plumbing Contractor. The word "provide" means furnish, install and connect.
- C. Do not scale drawings having 1/4" or smaller scale. Because of small scale, it is not possible to indicate all offsets, fittings, and accessories; provide such as are required for complete installation.
- D. The right is reserved to move any element as much as ten (10) feet at no increase in cost provided Contractor is notified before work in question is installed.
- E. Contractor shall be responsible for determining and verifying the characteristics of electrical current available to operate the mechanical equipment prior to ordering such equipment.
- F. Contractor shall be responsible for reviewing all drawings (Architectural, Mechanical, Electrical, Structural etc.). If any discrepancies are discovered between drawings, the contractor shall notify the Architect/Engineer prior to bidding so that an addendum may be issued for clarification.

1.3 CODES AND STANDARDS:

- A. The intent is that the complete installation shall comply with applicable laws and ordinances, utility company regulations, and applicable requirements of the following:
 - 1. International: Building Code, Gas Code, Mechanical Code, and Plumbing Code.
 - 2. NFPA: National Fire Protection Association.
 - 3. National Plumbing Code
 - 4. AGA: American Gas Association.

5. FM: Association of Factory Mutual Fire Insurance Company.
6. ASME: American Society of Mechanical Engineers.
7. ASTM: American Society of Testing Materials.
8. NSF: National Sanitary Foundation.
9. PDI: Plumbing Drainage Institute.
10. UL: Underwriters Laboratories.
11. NEC: National Electrical Code.
12. NEMA: National Electrical Manufacturer's Association.
13. SMACNA: Sheet Metal and Air Conditioning Contractors National Association.
14. ARI: American Refrigeration Institute.
15. PFMA: Power Fan Manufacturer's Association.
16. MSS: Manufacturer's Standard Society of Valve and Fittings Ind.
17. ANSI: American National Standard Institute.
18. API: American Petroleum Institute.
19. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers.
20. Tennessee Energy Code.
21. TOSHA: Tennessee Occupational Safety & Health Act.

1.4 COORDINATION OF WORK:

- A. Furnish and locate required anchor bolts, sleeves, inserts, supports, etc.
- B. Lines which pitch shall have right-of-way over lines whose elevations can be changed. Offsets, transitions and changes in direction in pipe and ducts shall be made as required to maintain proper headroom, pitch, etc.
- C. Coordinate all fixtures, etc. with floor, wall and ceiling patterns.
- D. The plumbing work shall be installed as neatly as possible in the locations shown but shall be subject to such deviations, modifications and relocations as may be necessary to conform to the requirements of the architectural drawings and as necessary to avoid interferences with the structural work and the work of other trades, and interferences between the various trades. This shall be done at no cost to the Owner. No ductwork, piping or equipment shall be installed which would require ceilings to be lower than required by drawings, unless approval is obtained from the Architect.
- E. If necessary to coordinate and expedite the work, the Contractor shall prepare "interference drawings" and submit them to the Architect for approval. Such drawings shall show the work of the various trades involved, illustrate proposed details of construction and arrangement of equipment and apparatus, and clearly indicate any deviations from contract requirements.
- F. Minor changes in arrangement may be made to suit unforeseen conditions, but no major deviation shall be made without written approval from the Architect. If any deviations are deemed necessary, submit all details of proposed changes and all reasons therefore, in writing, to the Architect for approval prior to making installation of such work.
- G. Contractor shall coordinate requirements for utility connections with municipal utility departments and utility companies. Installation of service taps, extensions, valves and metering provisions shall comply with criteria of appropriate authority, and any cost associated therewith shall be included in the bid amount.

1.5 DATA AND SHOP DRAWINGS:

- A. Prior to ordering, submit certified prints and/or descriptive data for major pieces of equipment, fixtures, valves, insulation, controls, etc. Stamp, sign and certify to be correct and in compliance with the Contract Documents, each drawing submitted for review. Drawing submitted without signed certification will be returned without review.
- B. Any deviation in submittal from contract documents of materials, capacities, space requirements in items furnished, etc. shall be listed in a letter accompanying submittal stating deviation and reason requested for consideration of acceptance.
- C. Submittals shall be bound in a 3 ring binder, clearly marked, and in order as indicated on drawings. Items submitted partially and in an unorganized manner shall be returned without review.
- D. Submittal shall show: manufacturer's catalog number, performance data with indicated operating points, finishes, optional features and modifications. Each sheet of printed submittal data shall be clearly marked (using arrows, underlining, or circling) to show the particular size, type, model number, ratings and options actually being proposed.
- E. When work in accordance with manufacturer's recommendation is specified, a copy of recommendations shall be kept in the job office.
- F. Furnish the number of copies required by the General and Special conditions of the contract but in no case less than six (6) copies.
- G. Shop drawings shall show sizes and details of required concrete and steel machine foundation, location of anchor bolts, physical dimensions of equipment, equipment weight or other pertinent data required for equipment support or installation.
- H. Approved shop drawings do not mean that drawings have been checked in detail; said approval does not in any way relieve the contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings or specifications.

PART 2 - PRODUCTS:

2.1 REFERENCE TO DRAWINGS:

- A. Reference shall be made to drawing schedules and details for: manufacturer, model, catalog number, size, capacity, performance, installation, etc. of equipment and material. Equipment of manufacturers other than those named, will be acceptable provided, in the opinion of the Engineer, it is of equal substance, function, performance and appearance.

2.2 CHOICE OF MATERIALS AND EQUIPMENT:

- A. In submitting substitutions, bidders should note the following minimum considerations: (1) capacities shown are absolute minimum and must be equaled, (2) physical size limitation for space allotted, (3) static and dynamic weight limitation (4) structural properties, (5) noise level, (6) vibration generation, (7) interchangeability, (8) accessibility for maintenance and replacement, (9) compatibility with other materials, assemblies, and (10) similar items shall be same manufacturer and style wherever possible.

- B. All material and equipment, for which a UL Standard, an AGA approval, or an ASME requirement is established, shall be so approved and labeled or stamped. Label or stamp shall be conspicuous and not covered, painted or otherwise obscured from visual inspection.
- C. Adhesives are not acceptable as a mounting, supporting, or assembling technique.
- D. Contractor shall pay any costs added to total contract as a result of any substitutions.
- E. Equipment, etc. shall not be purchased without Engineer's written approval.

PART 3 - EXECUTION:

3.1 EXISTING SERVICES:

- A. No service shall be interrupted without permission of the Owner. Owner must receive written request a minimum of 72 hours in advance of any anticipated shutdown.
- B. When encountered in work, protect existing active: sewer, water, gas, electric, other utility services, structures; when required for proper execution of work, relocate them as directed. If existing active services are not indicated, request Engineer for instructions.
- C. When encountered in work, whether or not indicated, cap or plug to otherwise discontinue existing inactive: sewer, water, gas, electric, other utility services, structures which interfere with work execution. Notify Engineer in writing of action taken. If removal is required, request instructions.

3.2 DRAWINGS:

- A. Drawings are diagrammatic. Contractor shall install the work in such manner that the equipment, piping, vents, conduit, panels, ductwork, etc. will fit in space provided, maintain headroom, and if in finished areas, be as neatly installed and "out-of-the-way" as physically possible. All equipment, piping, ductwork, conduits, etc., shall be installed to provide needed maintenance and passage space.

3.3 FEES:

- A. The contractor shall pay for fees and inspections as may be required for water and sanitary sewers, gas service, sprinkler systems, and all other systems requiring inspections by agencies having jurisdiction.

3.4 INSPECTION OF SITE:

- A. The drawings are prepared from the best information available and reflect the conditions commensurate with this information. However, the Contractor shall visit the site prior to submitting a proposal and shall verify the locations, sizes, depth, pressures, etc., of all existing utilities; and familiarize himself with working conditions, hazards, existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair the proper operation of the utilities, or the construction process, the Architect shall be notified in writing.
- B. All proposals shall take these existing conditions and any revisions required into account, and the lack of specific site information on the drawings shall not relieve the Contractor of his responsibility.

END OF SECTION

SECTION 22 01 03

PLUMBING COMPLETION ITEMS

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

1.2 CONNECTION TO EQUIPMENT:

- A. Work shall include all labor, material, equipment, etc. required including, but not limited to, the following: (1) provide domestic hot and cold water supply, drain, vent, gas, etc., and (2) connections to all equipment specified in this or other sections requiring such services.
- B. Indicated locations and sizes of equipment connections are approximate; exact locations and sizes of piping, valves, etc. shall conform to approved shop drawings. Connection sizes shall not be smaller than scheduled size or equipment outlet size, whichever is larger.
- C. Equipment furnished by other sections shall be properly equipped structurally and mechanically with all accessories, including plumbing, piping, drains, traps, tailpieces, supply fittings, gas lines, etc., internal to and part of the equipment installed by the equipment manufacturer or supplier, ready to receive single connections for each of the various mechanical items, except that this Division shall furnish shut-off valves and unions or flanges.
- D. Where existing equipment is removed, disconnect and cap lines, behind or below finished building surfaces.
- E. Verify all connections and rough-in locations with the Architect and/or the equipment supplier or contractor prior to the start of their work.

1.3 ADJUSTING AND TESTING:

- A. Before testing, protect from damage any control and indicating devices, etc. not designed to stand test pressures. Test all elements before covering or "closing in".
- B. Provide labor, material, instruments, fuel, electricity, water and other costs in connection with all tests. Installed instruments may be used for tests if calibrated and approved for the purpose.
- C. Conduct pressure, temperature, ampere, voltage, performance and operating tests for each system, equipment, unit motor, etc. as directed by and in presence of Engineer. Submit tabulation showing: (1) nameplate amperes and voltages, (2) actual full-load amperes and voltage for each phase of every motor, (3) overload element number and rating, (7) water pressures in and out of each pump and, (8) water flow at each pump. See Section 25 05 93 for additional test and balance requirements.
- D. Test all piping, except refrigeration, air and oil, hydrostatically to 1.5 times maximum working pressure, but in no case less than 125 PSIG, for at least 4 hours. Subject welded joints to hammer test while under pressure. Caulking or peening repairs not permitted.

- E. Obtain certificates of approval, acceptance and compliance with regulations from agencies having jurisdiction.

PART 2 - PRODUCTS:

2.1 RECORD AND AS-BUILT DOCUMENTS:

- A. Maintain at job site a set of contract record documents kept current by indicating thereon all changes, substitutions, etc. between work as specified and as installed.
- B. Furnish Engineer one (1) complete set of reproducible mylar record drawings and electronic drawing files showing installed location, size, etc. of all work and material.
- C. Show on record documents actual air quantities, water flow rates, valve or damper positions after balancing, etc.; also show, by actual dimension, location of all underground work.
- D. For each piece of equipment, provide the owner three (3) sets of: (1) manufacturer's printed catalog pages, operating and maintenance instructions, wiring and connection diagram, etc., (2) temperature-humidity and motor interlock control and wiring diagrams showing operation instructions for, and normal position of, each motor and controller, control valve, thermostat, etc., and (3) lubrication chart. Bind this information into 8-1/2" x 11" booklets. All three (3) sets shall be assembled in hardback binders.

PART 3 - EXECUTION:

3.1 OPERATING INSTRUCTIONS:

- A. Furnish to the Architect written operating and maintenance instructions for each system and each piece of equipment. Include in equipment data binder specified above: (1) instructions to start and stop each piece of equipment, (2) itemized maintenance schedule, (3) submittals.
- B. When systems are completely adjusted, furnish personnel for five (5) full days to instruct Owner's operators. When Owner operates on a 24-hour basis, each shift shall be properly trained.

3.2 CLEANING AND FLUSHING:

- A. Fixtures, Equipment, Etc.
 - 1. Fixtures, piping, equipment, etc. shall be cleaned per manufacturer's printed instructions and Engineer's instructions.
- B. Clean-Up of Piping:
 - 1. Piping shall be: (1) flushed with clean water, (2) "blown out" with steam or compressed air, or (3) "swabbed out" as required, except where specified otherwise. All temporary connections required for flushing shall be provided and subsequently removed by the Contractor.
 - 2. Care shall be exercised by contractor to prevent any other foreign matter from entering pipe or components of system during construction. Plug pipe ends or cover with burlap, or other material to keep out foreign materials. Before erection, each piece of pipe, fitting or valve shall be visually examined and all dirt or other foreign matter removed.
 - 3. Check system to determine that no leaks exist. Any leaks in piping shall be repaired before proceeding. Pipe shall be opened at lowest points and highest points for initial flush and blow down.

3.3 PAINTING:

- A. All equipment shall present a clean, painted appearance; touch-up, or repair, as required.
- B. All gas piping above ground, in or out of building, concealed or exposed, shall be painted yellow.
- C. Paint all equipment and other ferrous metal, which is not otherwise protected against corrosion. Paint exposed pipe threads with Bitumastic #50. Clean thoroughly all surfaces before painting.

3.4 IDENTIFICATION:

- A. Identify all pipe by providing colored pipe markers, identifying the piping using flow arrows and colored bands: (1) in all accessible locations at 20 ft. intervals, (2) at each valve, (3) at each branch takeoff point, and (4) where a pipe leaves or enters a wall or floor so that lines may be traced from start to finish. PIPE LABELS AND BANDS SHALL BE SNAP ON OR STRAP ON "SETMARK" AS MANUFACTURED BY SETON NAME PLATE CORPORATION, NEW HAVEN, CONNECTICUT 06519, or approved equivalent meeting this level of quality. Identification colors, legend, letter sizes shall conform to ANSI and/or OSHA specifications.
- B. Identify all major items of equipment, including control panels and associated starters, switches, relays, etc. by 2-1/2" x 3/4" metal nameplates. Secure with screws or brads, adhesives alone are not acceptable. Nameplates after installation shall be easily visible and shall bear notations corresponding to those shown on record drawings.
- C. Identify location of outside underground piping by: 4"x4"x18" concrete stakes, flush with finish grade, located above lines at ends and/or corners, and by 2"x2" brass plates imbedded in building walls above pipes. On stakes provide plate secured to post indicating size and type of line below, along with depth of pipe below grade.
- D. Contractor shall mark the location of each duct smoke detector and all fire dampers. The mark shall consist of red marking tape acceptable to the Architect location on the ceiling grid at the location of each device.

END OF SECTION

SECTION 22 01 04

PLUMBING GUARANTEE AND WARRANTY

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

1.2 TEST PERIOD: Each piece of equipment shall meet performance specifications after one (1) year's actual operation.

PART 2 - PRODUCTS:

Not used.

PART 3 - EXECUTION:

3.1 The Contractor shall replace, or make good, any defect due to faulty workmanship or material, which shall develop within one (1) year from date of acceptance at no cost of Owner. This guarantee shall cover both material and labor and shall include: (1) refrigerant and oil replacement, (2) any adjustments or service required, and (3) any necessary adjustments in system control set points when required, but no filter maintenance. The Contractor is responsible to replace work found not in conformance with the contract at any time during the life of the installation. Replacement of non-conforming work is not subject to the one-year warranty limitation.

3.2 Date of Acceptance shall be certified by the Engineer as that date on which the contract has been satisfactorily completed in accord with Contract Documents. If a whole or partial system, or equipment is put into use for benefit of any party, other than contractor and with prior written permission of the Owner, this agreed date shall become the "Date of Acceptance" for that piece of equipment or system.

3.3 CERTIFICATE: Prior to completion and final acceptance of the facility, furnish to the Engineer certification that the mechanical systems have been tested and that the installation and performance of those systems conform to the Contract Documents.

3.4 See other sections for additional warranty requirements.

END OF SECTION

SECTION 22 01 05

PLUMBING BASIC MATERIALS AND METHODS

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

PART 2 - PRODUCTS:

2.1 ACCESS PANELS:

- A. Provide access panels, or doors, at concealed valves, shock absorbers, vents, traps, trap primers, inspection points, etc. and where noted. Panels shall be galvanized steel, 16 gauge frame, 14 gauge door with mounting accessories, spring hinges, screwdriver operated lock, and prime coat paint. Milcor "A" for acoustic tile, "M" for exposed masonry, "K" for plaster finishes, stainless steel for ceramic, or glazed structural tile. Where ceiling is "lift out" construction, ceiling access panels are not required. Panels shall be 18" x 18" or larger, as required for service intended.
- B. Access panels in fire rated construction shall have a UL label, Class B rating.

2.2 ROOF MOUNTED EQUIPMENT: All roof-mounted equipment shall be furnished with a roof curb designed for flashing to roof and so designed to meet roof slope and make equipment level. Roof curbs shall be designed for Seismic Zone 2 and have an "R" rating from the state of California.

2.3 CONCRETE: Where required for thrust blocks, pipe system encasement, equipment bases, etc. for Division 22, provide 3,000-PSI concrete.

PART 3 - EXECUTION:

3.1 EXCAVATION, SHORING AND BACKFILL:

- A. Provide any excavation required for this Division below that is needed for general construction. Unless specifically noted, no extra shall be paid if rock or excavation difficulties are encountered.
- B. Provide separate trench for each utility.
- C. Provide: (1) bracing, shoring, etc. to protect sides of excavation, (2) staging, suitable ladders, barricades, etc. Comply with local regulations, or absence thereof with Division of the Manual of Accident Prevention provided for in Construction of the AGC.
- D. Existing pavements, bases, curbs and gutters and sidewalks shall be cut and brought to a straight, vertical edge by mechanically sawing. Expansion joints removed shall be replaced.
- E. Maximum trench width is as shown on plans or 1.5 feet + O.D. of pipe or cable.
- F. Minimum trench width shall be sufficient to permit thorough compaction of the bedding material under and around the pipe or cable.

- G. All soft or otherwise unsuitable material shall be removed from the trench bottom and replaced with compacted crushed stone or other approved material.
- H. Bedding materials shall be the superior of class shown on approved plans or clean washed stone of 3/4-inch maximum particle size. Bedding shall provide a minimum of 6-inches cover above the pipe or cable unless otherwise shown on approved plans. Stone shall be brought up evenly on both sides of the pipe in 6-inch layers and tamped, rodded, or vibrated as required to provide a firm base and bedding around the pipe or cable.
- I. Remove all timber before backfilling. Backfill simultaneously on both sides of tanks, piping, etc. Backfill material shall be approved clay or chert, free of debris, rock larger than 1"Ø or other harmful material.
- J. All backfilling shall be compacted to 90% under sidewalks, or grass areas, and to 95% when under paved areas, structures, building slabs, and steps. etc. These percentages refer to "Percent of Maximum Density" per ASTM #D-1557. If more stringent, compact backfill to a dry density equal to that required by G.C.
- K. Restore existing pavement, curbs, sidewalks, sodding, etc. removed or damaged in connection with work.

3.2 CUTTING AND PATCHING:

- A. Provide all cutting, patching, etc. incident to this work.
- B. Do not cut into any structural element without written approval of Engineer.
- C. Patching shall be: (1) of quality equal to, and of appearance matching existing construction, and (2) shall restore all services and construction which remains in use to its condition prior to this contract, unless otherwise noted.

3.3 PIPING THRU RATED WALLS AND FLOORS:

- A. Insulation on pipe passing thru fire rated walls must stop at pipe sleeve. Space between metal pipe and sleeve shall be protected with 3M Fire Barrier Penetration Sealing System or approved substitute. Installation shall be in accordance with the manufacturers recommendations for the hourly fire rating of the partition. The system shall be U.L. listed. Maintain vapor barrier on insulated chilled water and refrigerant suction piping.
- B. PVC pipe passing through rated walls or floors shall have 3M UL modified fire protection system.
- C. Refer to details on drawing for pipe and duct penetration thru rated walls and floors.

3.4 FLASHING:

- A. Where pipes, pass through roof, flash per drawing details. Where no detail is shown, use National Roofing Contractors Association Details.
- B. Locate pipes, etc. through roof to clear parapets, etc. by at least 18".
- C. Provide flashing or caulking as required at each opening through outside walls or roof. Flashing through roof of same materials and methods as under "Moisture Protection Division"; through walls shall be aluminum unless noted otherwise.

- D. Provide necessary curbs to receive flashing. See SMACNA Plate #65 and/or drawing details.

3.5 PROTECTION:

- A. Work shall be protected at all times. Pipes openings shall be closed with caps or plugs until permanent connections are made. Fixtures and equipment shall be covered if necessary, to protect against dirt, water, chemical or mechanical damage or defacement.

3.6 TEMPORARY WORK:

- A. Provide 3/4" water service with hose faucet 18" above grade located per instructions. Provide freeze protection. Upon completion of project: (1) close branch cock, (2) cap at point 18" below grade, (3) mark with concrete post.
- B. Water and electricity consumed during construction shall be paid for by General Contractor.

END OF SECTION

SECTION 22 05 29

SUPPORTS AND ANCHORS

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.
- B. Support (1) from wood using coach screws on open construction and hanger flanges on sheeting, (2) from concrete using inserts, (3) from steel using beam clamps, rivets or bolts, (4) from concrete blocks using toggle or through bolts. Fasten supports to building in following order of preference: (1) steel framing, (2) concrete, (3) wood framing, (4) masonry, (5) wood sheathing. Do not support from roof deck without approval. All hangers, rods, and inserts shall be Underwriters Laboratories approved for the service intended and shall meet MSS #SP-58 & 69, and SMACNA guidelines for Seismic restraints of mechanical systems and plumbing piping system, October 3, 1982.
- C. Adhesives are not acceptable as mounting or supporting devices.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Plumbing General Provisions, See Section 22 01 01.
- B. Plumbing Basic Materials and Methods, Section 22 01 05.
- C. Vibration and Seismic Control for Plumbing and Equipment, Section 22 05 48.

PART 2 - PRODUCTS:

2.1 HANGERS:

- A. Use adjustable swivel ring band type for pipe 2-1/2" and smaller, except C.I. For pipe 3" and larger and for cast iron pipe, unless otherwise noted, use adjustable steel, clevis type.
- B. At each hanger on insulated pipe provide: (1) pipe covering protection saddles on hot lines and (2) insulation shields on cold lines.
- C. Shields/saddles to be 16 gauge, minimum 120° saddles arc with the following minimum saddle lengths:

| <u>PIPE SIZE</u> | <u>MINIMUM SADDLE LENGTH</u> |
|------------------|------------------------------|
| 1 | 12" |
| 2 | 12" |
| 3 | 12" |
| 4 | 12" |

- D. Hanger surface material shall be such that there will be no possibility of electrolytic corrosion between hanger and pipe.

- E. Anchors requiring explosive charges **shall not be used**. Phillips "Red-head" shields can be used for loads under 300 lbs.

2.2 BASES:

- A. On motor-driven equipment, where motor is not directly mounted on driven equipment, provide a structural steel base, reinforced to prevent flexure, which shall support both the equipment and the motor.
- B. Provide bolts, inserts, pipe stands, brackets and accessories to distribute loads over building structure.

PART 3 - EXECUTION:

3.1 HORIZONTAL PIPING SUPPORT SCHEDULE:

| <u>PIPE SIZE</u> | <u>ROD DIA.</u> | <u>STEEL MAX. SPACE</u> | <u>COPPER MAX. SPACE</u> | <u>PVC MAX. SPACE</u> |
|------------------|-----------------|-------------------------|--------------------------|-----------------------|
| Up to 1/2" | 1/4" | 6' | 4' | 3-1/2' |
| 3/4" to 1" | 3/8" | 7' | 5' | 4' |
| 1-1/4" | 3/8" | 7' | 7' | 5' |
| 1-1/2" | 3/8" | 8' | 8' | 5' |
| 2" | 3/8" | 10' | 8' | 5' |
| 2-1/2" | 1/2" | 11' | 9' | 6' |
| 3" | 1/2" | 12' | 10' | 6' |
| 4" | 5/8" | 14' | 11' | 6-1/2' |

3.2 METHOD:

- A. Support horizontal cast iron pipe with hanger, or pier, located close to the hub; use one support for each pipe length, or every other joint, whichever is closer.
- B. Provide hanger within 18" of each elbow, also provide hanger within 18" of connection to each piece of equipment.
- C. Support hubless cast iron at every length near fitting. Where maintenance requirements may impose torque, as at a cleanout, support on both sides of torque point.
- D. When supporting PVC pipe, provide 18 ga. 12" long shield at each hanger.
- E. Pipes passing thru walls shall not bear on building construction.
- F. Hangers shall be sized to fit outside diameter of insulation and shield/saddle. Provide shields at each hanger. On 2 1/2" and larger pipe, provide an "insert" 18" longer than the shield/saddle specified above; use Foamglass or calcium silicate or polyurethane foam with a jacket (same as insulation) on the "run" of the pipe. Hanger shall not bear on insulation.
- G. All floor-mounted equipment shall be mounted on a reinforced concrete base covering the complete floor area of equipment. This concrete base shall be 4" high and shall extend 6" beyond the equipment on all sides. The concrete base shall be doweled into the building concrete slab. Provide all necessary anchor bolts and templates. Provide 1/4" thick layer of non-shrinking grout between floor-mounted machinery and concrete pad. Where equipment mounts on structural steel, provide shims. Chamfer each edge a minimum of 3/4" x 3/4".

- H. Any piece of equipment installed in a finished ceiling, or wall area, shall be supported independently of the building finish. Ceiling-mounted items shall be supported directly from the building structure.
- I. Suspended equipment shall be supported from building structure by adjustable rods.

END OF SECTION

SECTION 22 05 53

IDENTIFICATION OF PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

PART 2 - PRODUCTS:

PART 3 - EXECUTION:

3.1 IDENTIFICATION:

- A. Identify all pipe by providing colored pipe markers, identifying the piping using flow arrows and colored bands: (1) in all accessible locations at 20 ft. intervals, (2) at each valve, (3) at each branch takeoff point, and (4) where a pipe leaves or enters a wall or floor so that lines may be traced from start to finish. **PIPE LABELS AND BANDS SHALL BE SNAP ON OR STRAP ON "SETMARK" AS MANUFACTURED BY SETON NAME PLATE CORPORATION, NEW HAVEN, CONNECTICUT 06519**, or approved equivalent meeting this level of quality. Identification colors, legend, letter sizes shall conform to ANSI and/or OSHA specifications.
- B. Identify all major items of equipment, including control panels and associated starters, switches, relays, etc. by 2-1/2" x 3/4" metal nameplates. Secure with screws or brads, adhesives alone are not acceptable. Nameplates after installation shall be easily visible and shall bear notations corresponding to those shown on record drawings.
- C. Identify location of outside underground piping by: 4"x4"x18" concrete stakes, flush with finish grade, located above lines at ends and/or corners, and by 2"x2" brass plates imbedded in building walls above pipes. On stakes provide plate secured to post indicating size and type of line below, along with depth of pipe below grade.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL:

1.1 WORK INCLUDED:

- A. Work required under this section consists of insulation for piping and duct systems and equipment as hereinafter specified.
- B. Certain equipment and/or systems to be factory insulated by manufacturer. Factory insulation materials to be as specified in applicable sections of the specifications.
- C. Treat insulated pipe and duct surfaces in equipment rooms and where exposed to normal view, so surfaces may be painted with paint similar to Foster (BF) "Lagtone" color paint or good quality water base latex paint. Use of mastics, adhesives or jacketing which cause "bleeding" is prohibited.
- D. Thermal resistance "R" values used herein are expressed in units of "Hour degrees F sq. ft/BTU per inch of thickness" on a flat surface at a mean temperature of 75 degrees F, unless specifically noted.
- E. Note that where electric cable wrap is called for, insulation to be applied over cable. (See Section 22 11 19)
- F. All valves, flanges, fittings, etc. shall be insulated with same thickness of insulation as specified for piping.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Mechanical General Provisions, Section 23 01 01.
- B. Basic Materials and Methods, Section 23 01 05.
- C. Plumbing Piping, Section 22 10 00.
- D. Heat Exchangers, 22 35 00

1.3 CERTIFICATION:

- A. Insulation for above grade, inside building, pipe and equipment coverings, to be certified by manufacturer as having fire hazard classification rating, when tested in accordance with ASTM E 84, NFPA 225 and UL 723, not exceeding the following. "Insulation" to consist of insulating material, fittings, jacket, tapes, mastic, attachments and adhesive, either as a "system" or as an individual component when used separately.
 - 1. Piping insulation flame spread less than 25, fuel contribution less than 50, and smoke development less than 200. Piping system located inside ceiling plenums or equipment rooms utilized for return air plenums to have maximum smoke development of 50.
 - 2. Flexible tubular elastomeric piping insulation (Rubatex or Armaflex) - flame spread of 25 and smoke development of 200.

- B. Pipe, for above grade exposed to weather outside building, insulation to be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.
- C. Certify that all piping insulation meets the minimum requirements of the current issue of the "Local and/or State Code for Energy Conservation in New Building Construction.

1.4 MATERIALS FOR PIPE AND EQUIPMENT:

- A. Provide factory pre-molded, segment type insulation for pipe, pipefittings, and valves, unless hereinbefore exempted. Fitting insulation to be of same thickness and material as adjoining pipe insulation.
- B. Install 0.016 ga. smooth aluminum jacket on all pipe insulation in mechanical rooms, tunnel areas, valve rooms and where exposed to weather. Where piping insulation has metal jacket, fittings, etc. shall be covered with factory formed humped aluminum covers equivalent to "Elljacs."

PART 2 - PRODUCTS:

2.1 GLASS FIBER:

- A. Provide factory-formed, factory-jacketed "system" type conforming strictly to fire-resistive qualities hereinbefore specified in ""Certification" paragraph. Jacket to be ASJ-SSL factory applied reinforced with vapor barrier. System" density to be not less than 4 pounds per cubic foot. Product must be guaranteed by manufacturer to have continuous operational temperature limit of not less than 500 degrees F and a minimum "R" value of 4.00. All service jacket to be fiberglass reinforced white Kraft paper with aluminum foil. Provide insulation for following services:
 1. Domestic cold water - 1" thick; domestic hot water - 1" thick; hot water recirculating lines - 1" thick.

2.3 MATERIALS FOR FITTINGS, VALVES AND SPECIAL COVERINGS:

- A. Provide coverings and finishes for specific items hereinafter specified.
 1. Provide factory pre-molded glass fiber fitting covers, matching basic insulation, equivalent to those manufactured by Hamfab, for all insulated pipe fittings (elbows, tees, etc.) and finished with glass fabric and vapor barrier mastic. Glass fiber blanket inserts with PVC covers are not acceptable for pipe fitting insulation.
 2. For pipe fittings, valves, and other irregular surfaces, in systems operating below 70 degrees F., when inside building or in equipment rooms, insulate with glass fiber of same thickness as adjoining pipe and cover insulation with white colored woven glass fabric imbedded in vapor barrier coating Foster 30-36 or equal.
 3. For any service when above grade exposed-to-the-weather outside building or within 7'-0" of mechanical room floors, cover straight pipe insulation with 0.016" thick aluminum, smooth jacketing only. Corrugated type not acceptable. Fittings, etc. are to be covered with factory formed humped aluminum covers equivalent to Elljacs.
 4. Expansion joints shall be insulated with a removable wrap-around insulation jacket as manufactured by ATP, Inc. or approved equal.

PART 3 - EXECUTION:

3.1 GENERAL:

- A. Pipe systems shall have been tested and found free of all leaks prior to installation of insulation covering. Verify with Engineer.
- B. Insulation shall be continuous through walls, floors, partitions, etc. Do not insulate finished surfaces on fixture trim. On fixture connections, bring insulation to inside face of wall. Escutcheon shall be sized to cover pipe and insulation.
- C. No insulation shall be cut where a hanger is located.
- D. All surfaces to be cleaned of grease, dirt, dust, scale and dry when covering is applied. Covering to be dry when installed and before and during application of any finish, unless such finish requires specifically a wetted surface for application.
- E. All adhesive, cements and mastics to be compatible with materials applied and shall not attack materials in either wet or dry state.
- F. Install all insulation products in strict accordance with manufacturer's instructions using professional insulators who have adequate experience and ability.
- G. Exposed to view insulation shall have a well-tailored appearance.
- H. All items requiring service such as strainers, balancing valves, etc. provide removable insulation caps of insulation equal in thickness to pipe covering.
- I. See Section 22 01 01 for sleeves and insulation requirements.
- J. Secure fiberglass pipe insulation, using self-sealing 3" side sealing strip and butt joints. Install longitudinal jacket laps concealed from normal view.
- K. Cover all joints, rips, tears, punctures, disc heads, staples, or breaks in vapor barrier jacket with 4" wide woven glass fabric tape embedded in gray or white vapor barrier fire resistant coating.

3.2 INSTALLATION OF PIPE COVERING:

- A. Where glass fiber insulation is used on piping sized 3" and larger, insert a section of foamed glass insulation, at hanger or support points, between pipe and metal shield for full length of shield, to prevent crushing of insulation. Insulation thickness to be same as adjoining glass fiber insulation.
- B. Apply foamed cellular glass insulation to equipment, pipe and fittings with all joints tightly fitted to eliminate voids. Seal all joints using equivalent of Foster No. 95-44 mastic. Do not fill voids with joint sealer.
- C. Apply flexible tubular elastomeric insulation to pipe and fittings with all joints tightly fitted and sealed with adhesive and tape. Longitudinally split insulation will not be acceptable unless specifically approved in writing by Engineer. Fittings, valves etc. shall be insulated by mitering or nesting, sizes together to properly insulate the joint. Insulation shall not be slipped and bent around elbows, but shall be mitered. At tees and valves insulation shall be slit and slipped around the pipes. Insulation exposed to weather shall be finished with 2 coats of weatherproof finish.

- F. Aluminum jacketing shall be held in place with Stainless Steel bands on 12" center. Side and end laps of aluminum jacketing shall be at least 2" wide and cut edge of side lap shall be turned under 1" to provide a smooth edge. Valves and fittings shall be finished with factory jacketing and humped aluminum elbow covers. Joints shall be sealed on CW lines before applying jacketing.

- G. All valves, including body bonnet, flanges, fittings, etc. shall be insulated with same type and thickness of insulation as adjoining piping.

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL:

1.1 DESCRIPTION OF WORK:

- A. Provide all labor, material, equipment, services, etc. required to provide a complete installation specified herein and/or shown or scheduled on the drawings.
- B. Examine carefully architectural, equipment, electrical, mechanical and structural drawings and each division of this specification for items not a part of this plumbing section, which may require plumbing connections. Unless explicitly indicated to the contrary, Contractor shall provide necessary supply, waste and vent lines, and make final connections to such items. It shall be Contractor's responsibility to locate supply, waste and vent lines, to such items in conformity with approved manufacturer's rough-in drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. General Provisions Section 22 01 01.
- B. Completion Items, Section 22 01 03.
- C. Guaranty and Warranty, Section 22 01 04.
- D. Basic Materials and Methods Section 22 01 05.
- E. Hangers and Supports for Plumbing Piping, Section 22 05 29.
- F. Plumbing Piping Insulation Section 22 07 19.
- G. Domestic Water Piping Specialties, Section 22 11 19.
- H. Plumbing Fixtures, Section 22 40 00.
- I. Plumbing Equipment, Section 22 30 00.
- J. Fuel Piping System, Section 22 16 00.

1.3 DOMESTIC WATER PIPING SYSTEMS: Work included under this section consists of plumbing work, principal systems of which are as follows:

- A. Water Supply System: Make connections to utility water supply. Extend and connect hot and cold water to fixtures and equipment provided under this and other sections.
- B. Vacuum Systems: Provide complete vacuum system including all equipment, piping, controls, accessories, etc.

1.4 CONNECTIONS FOR EQUIPMENT FURNISHED BY OTHERS:

- A. The Contractor shall provide all roughing-in connections for and all equipment requiring water, drains, etc. The equipment manufacturer shall furnish shop drawings to the Contractor who

shall rough-in accordance with these shop drawings, and make final connections after the equipment supplier has set his equipment.

- B. The Contractor shall provide all stops, supplies, traps, tailpieces, reducing valves, vacuum breakers, etc. as required to make each sink or piece of equipment operable.

PART 2 - PRODUCTS:

2.1 METER BOX AND WATER PIPING:

- A. Tap existing water main with a tapping sleeve and valve and provide meter box with covers, valves, etc., in accordance with local utility company's recommendations and requirements. Verify pricing schedule and utility company's participation prior to bidding.
- B. Contractor shall pay all tap fees required by utility company.

2.2 POTABLE WATER PIPING MATERIALS:

- A. 3" and smaller, outside building: Type L hard-drawn copper with wrought copper solder fittings type CHD. Contractor's option for sizes 1-1/4" and smaller: Type L, type CSD.
- B. Inside building: Type L hard-drawn copper in wrought copper solder fittings Type CHD.
- C. 1-1/4" and smaller below grade, inside building: Type L soft-drawn copper, Type CSD.
- D. Brass or bronze adapter fitting shall be used where necessary and shall be iron pipe size and thickness where required for fixture or equipment connections. Connections of copper pipe to ferrous pipe shall be made with dielectric unions or couplings.

PART 3 - EXECUTION:

3.1 DOMESTIC WATER PIPING:

- A. From cold water main extend distribution mains, risers, and branches to all equipment and fixtures requiring cold-water connections. From hot water generators extend similar lines to all equipment and fixtures requiring hot water connections. Install a "full port" ball valve in each major branch take-off in the hot and cold-water distribution mains and elsewhere as necessary for control of the system or as shown on the drawings.
- B. Water piping shall be run so that the system can be drained at the low point by opening valves; provide drain valves at low points, 3/4" size if not otherwise noted. Run piping concealed in chases, pipe shafts, and space above ceilings throughout finished spaces, except at fixture connections and elsewhere as specifically noted otherwise. Vent all high points when piping is installed below grade, joints other than welded or soldered are prohibited.
- C. Water piping shall have a minimum pitch of 1" to 40'.
- D. Refer to fixture connection schedule on drawings for branch sizes to individual fixtures.
- E. Positively support water pipes immediately behind each flush valve; no piping shall be loose.
- F. Provide sealed bellows type shock absorbers for each self-closing faucet, quick-closing valve, solenoid valve, flush valve and/or where noted. When in battery install shock absorbers per P.D.I. Standard.

- G. Where not possible to provide minimum air gap per ANSI #A-40.4.42, provide a reduced pressure backflow preventer or vacuum breaker.
- H. Provide vacuum breakers at: (1) all flush valves, (2) all hose faucets, (3) all laboratory cocks, etc. Install on discharge side of final control valve.
- I. Use dielectric unions where dissimilar metals are joined.
- J. Backflow preventer must be installed above grade in a "non-flooding" location.
- K. Pipes passing thru fire rated walls shall be sealed off in accordance with detail on drawings.
- L. Tests:
 1. Test water piping hydrostatically not less than 125 PSI or 1-1/2 times the maximum working pressure, whichever is greater. Test when water and average ambient temperatures are approximately equal. Maintain test for not less than 4 hours without appreciable drop. Leaks in screwed fittings shall be corrected by remaking the joints. Leaks in welded joints shall be cut out and re-welded.
 2. Test underground lines with joints uncovered and with backfill deposited to 12" over 8" and smaller pipe, and 24" over larger pipe, except at joints.
- M. Coordinate timing for shutting off existing water service with appropriate officials and local utility company.

3.2 ELECTRICAL GROUND:

- A. This Contractor shall make provisions for maintaining the electrical ground properties of water lines by strapping over valves or equipment whose removal for service work in future would break grounding service. Strapping over shall be done with a length of braided copper cable, which shall be attached to pipe at either end.

3.3 CHLORINATION OF DOMESTIC WATER LINES:

- A. Flush entire system, until water flows clear from all openings. Drain and clean strainers and dirt pockets.
- B. After the domestic water piping system has been tested and cleaned, the system shall be sterilized in accordance with the requirements of the State Department of Public Health by the following methods:
 1. Introduce HTH solution, chlorine gas, or similar chlorination agent in sufficient quantity to produce a residual of 50 ppm of chlorine, as determined by residual chlorine tests at the ends of lines, and allow to stand for not less than 24 hours. Fill the lines slowly and open and close all valves while the chlorine is being introduced into the system. Operate valves, pumps, etc. at least 5 times, or 5 minutes.
 2. After the disinfecting solution has been left standing for 24 hours flush out the system until chlorine content is less than 1.0 PPM and/or water is comparable to that supplied by the water utility. If after flushing out the system, bacteriological samples are not satisfactory, repeat the disinfection process until satisfactory bacteriological samples can be obtained.
- C. Disinfection of new supply mains shall be performed before these mains are connected to the existing water supply mains. Where connecting into the existing mains and it is not practical to include the connecting pieces (i.e., pipe, fittings, and valves) in the normal disinfecting process, these connecting pieces shall be swabbed with chlorine solution containing not less than 100 ppm available chlorine prior to making the connection.

- D. Have samples obtained from end of longest piping run, analyzed by water utility chemist and submit copy of test to Engineer. If test results are unsatisfactory, rechlorinate system until test is satisfactory, at no cost to the Owner.

END OF SECTION

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL:

1.1 DESCRIPTION OF WORK:

- A. Provide all labor, material, equipment, etc. required to complete installation specified herein and/or shown or scheduled on the drawings.
- B. Examine carefully architectural, equipment, electrical, mechanical and structural drawings and each division of this specification for items not a part of this plumbing section, which may require plumbing connections. Unless explicitly indicated to the contrary, Contractor shall provide necessary supply, waste and vent lines, and make final connections to such items. It shall be Contractor's responsibility to locate supply, waste and vent lines, to such items in conformity with approved manufacturer's rough-in drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Plumbing General Provisions Section 22 01 01.
- B. Plumbing Basic Materials and Methods Section 22 01 05.
- C. Plumbing Piping Insulation Section 22 07 19.
- D. Plumbing Fixture, Section 22 40 00.
- E. Plumbing Equipment, Section 22 30 00.
- F. Electrical Connections, Division 26.

PART 2 - PRODUCTS:

2.1 BACKFLOW PREVENTERS:

- A. Backflow preventers on lines 3/4" through 2" pipe size shall be Watts No. 009 Series, or approved substitute, complete with ball valves, strainers, test cocks installed with required air gap at vent opening to drain line.
- B. Backflow preventers on lines 2 1/2" through 6" pipe size shall be Watts No. 909 Series, or approved substitute, complete with rising stem-type gate valves, test cocks installed with required air gap at vent opening to drain lines. Contractor shall install line size strainer on inlet side of the assembly.
- C. All backflow preventers shall be complete with funnel and required air gap. Pipe discharge to nearest suitable drain, and must have State Health Department approval.

2.2 PRESSURE REDUCING VALVES:

- A. Pressure reducing valves shall be installed when water pressure at building exceeds 80 pounds and as indicated on the drawings. The reducing valves shall be installed complete with inlet strainer, 3-valve bypass, and pressure gauges on the reduced & incoming pressure side.

- B. Meet ASSE Standard No. 1003, at a maximum reduced pressure fall-off of 10 psi.

2.3 PRESSURE GAUGES:

- A. Pressure gauges for water shall be 4-1/2" dial size Ashcroft 1000, or approved substitute, with range required or noted on drawings. Install with gauge cock. Select range so "operating point" is approximately mid-range.

2.4 SHOCK ABSORBERS:

- A. Provide at all quick-closing valves and/or where shown sized per PDI-WH201, or as noted.
- B. Provide sealed air chamber type shock absorbers by Zurn or Watts in water lines, which supply flush valves and solenoid valves, where solenoid valves are used. Furnish Accumitrol in lieu of standard shock test. Placement of absorbers and size shall be as shown on drawings.

2.5 TRAP PRIMERS:

- A. Provide where noted and/or required by code.
- B. Trap primer shall be located above accessible ceilings or located in wall using a lockable valve box. All related piping shall be concealed above finished ceiling, behind finished wall and below finished floor.

2.6 DRIP PANS:

- A. Where water and drain pipes pass over electrical equipment, provide drip pans of size as required (minimum 12" wide) to protect affected areas.
- B. Pans, 18 gauge galvanized sheet metal, edges turned up 2-1/2" on all sides, reinforced by rolling edge. Insulate exterior surface of drip pan with Armaflex sheet insulation.
- C. Provide 1-1/4" drain (schedule 40 PVC or Type "M" copper) to above nearest floor drain.

PART 3 - EXECUTION:

- 3.1 Note drawing details for installation arrangements.
- 3.2 All lines shall maintain uniform grades from each low point to the adjacent high points.
- 3.3 All lines shall be installed so that they can be vented and drained completely.
- 3.4 Unless noted, provide manual vents at high points and manual drains at low points. The intent is that all piping can be vented and/or drained.
- 3.5 Backflow preventer must be installed above grade in a "non-flooding" location.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL:

1.1 DESCRIPTION OF WORK:

- A. Provide all labor, material, equipment, services, etc. required to provide a complete installation specified herein and/or shown or scheduled on the drawings.
- B. Examine carefully architectural, equipment, electrical, mechanical and structural drawings and each division of this specification for items not a part of this plumbing section, which may require plumbing connections. Unless explicitly indicated to the contrary, Contractor shall provide necessary supply, waste and vent lines, and make final connections to such items. It shall be Contractor's responsibility to locate supply, waste and vent lines, to such items in conformity with approved manufacturer's rough-in drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. General Provisions Section 22 01 01.
- B. Completion Items, Section 22 01 02.
- C. Guaranty and Warranty, Section 22 01 04.
- D. Basic Materials and Methods Section 22 01 05.
- E. Domestic Water Piping, Section 22 11 16.
- F. Hanger and Support for Plumbing Piping and Equipment, Section 22 05 29.
- G. Domestic Water Piping Insulation, Section 22 07 19.
- H. Sanitary Waste Piping Specialties, Section 22 13 19.
- I. Plumbing Fixtures, Section 22 40 00.
- J. Plumbing Equipment , Section 22 30 00.

1.3 PLUMBING SYSTEMS: Work included under this section consists of plumbing work, principal systems of which are as follows:

- A. Sanitary Waste and Vent Piping System: Provide sanitary waste drainage and vent piping including connecting fixtures provided under this and other sections.

1.4 CONNECTIONS FOR EQUIPMENT FURNISHED BY OTHERS:

- A. The Contractor shall provide all roughing-in connections for and all equipment requiring water, drains, etc. The equipment manufacturer shall furnish shop drawings to the Contractor who shall rough-in accordance with these shop drawings, and make final connections after the equipment supplier has set his equipment.

- B. The Contractor shall provide all stops, supplies, traps, tailpieces, reducing valves, vacuum breakers, etc. as required to make each sink or piece of equipment operable.

PART 2 - PRODUCTS:

2.1 SANITARY SEWERS:

- A. Waste and vent piping above and below grade shall be Schedule 40 PVC with D.W.V. fittings. PVC pipe shall not be used in return air plenums. In return air plenums, use service weight hubless iron pipe and fittings, Type CIS.

2.2 CLEANOUTS AND ACCESS COVERS:

- A. Cleanouts for horizontal cast iron pipe, Type 1. For vertical cast iron pipe, Type 2. For threaded pipe, Type 3. For pipe concealed in walls, Types 4, 5, 6 or as noted.
- B. Provide cleanouts in underground piping with extensions and covers as follows:
 1. For extension to grade, Type 7, terminate flush with grade in 12" x 12" 4" concrete pad.
 2. For extension to finished floor, cleanouts with access covers as follows: Square Ceramic Tile - Type 8; Resilient Tile - Type 9; Terrazzo - Type 10; Other types - Type 11.
 3. For finished floors containing waterproof membrane, use Type 12; refer to architectural floor plan for areas shown to have such membrane.
 4. For rough finished floors, use Type 13.
 5. All cleanouts shall be flush with finish floor or wall.

PART 3 - EXECUTION:

3.1 WASTE, VENT, AND DRAINAGE:

- A. Use reducing fittings for changes in pipe size.
- B. Fittings for waste, vent, and drainage piping to be drainage pattern type.
- C. Soil, waste, and vent piping above ground shall be concealed in walls, chases, pipe shafts and ceiling spaces, except in equipment rooms and similar unfinished areas and elsewhere as specifically indicated otherwise. All soil and waste piping inside the building shall be run with a uniform drop of not less than 1/8" per foot, using 1/4" per foot where possible.
- D. Vertical vent lines shall be carried through the roof or connected to adjacent vent lines as indicated. Vents shall terminate approximately 12" above finished roof lines, 12' horizontally from window, shall be 3" or larger, and shall be flashed with base and sleeve type into top of vent pipe.

Collect vents where possible to minimize the number of vents extending through roof. Where vent stacks are at outside walls, offset below roof so terminal is 18" from edge of roof.

- E. Test all elements of system under 10' hydrostatic head minimum pressure on highest joint. System may be tested in sections. System shall stand for four (4) hours without showing leaks.

3.2 CLEANOUTS:

- A. Locate line size cleanouts (or 4" minimum) at base of each soil and waste stack; at each 90° change in direction in soil, waste, and drain lines; and in all horizontal drain lines, with spacing not to exceed 100' inside the building and outside the building.

- B. Cleanouts not accessible, which cannot be made easily accessible otherwise, shall be extended up through floor or wall.
- C. Install cleanouts in locations which will provide the following clearance for rodding: clearance at least 18" for pipes 3" and larger; 12" for sizes under 3".
- D. Set cleanout plugs using graphite and oil.

END OF SECTION

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL:

1.1 DESCRIPTION OF WORK:

- A. Provide all labor, material, equipment, etc. required to complete installation specified herein and/or shown or scheduled on the drawings.
- B. Examine carefully architectural, equipment, electrical, mechanical and structural drawings and each division of this specification for items not a part of this plumbing section, which may require plumbing connections. Unless explicitly indicated to the contrary, Contractor shall provide necessary supply, waste and vent lines, and make final connections to such items. It shall be Contractor's responsibility to locate supply, waste and vent lines, to such items in conformity with approved manufacturer's rough-in drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. General Provisions Section 22 01 01.
- B. Basic Materials and Methods Section 22 01 05
- C. Plumbing Piping Insulation Section 22 07 19.
- D. Domestic Water Piping, Section 22 11 16
- E. Plumbing Fixtures, Section 22 40 00.
- F. Plumbing Equipment, Section 22 30 00.
- G. Electrical Connections, Division 26.

PART 2 - PRODUCTS:

2.1 TRAPS:

- A. Each fixture shall have an accessible trap with brass cleanout.
- B. Sinks, lavatories, and similar fixtures shall have cast brass, adjustable, swivel, ground joint traps.
- C. Each indirect waste pipe shall be trapped.
- D. On acid waste, provide polypropylene trap and polypropylene union-type fittings.

2.2 TRAP PRIMERS:

- A. Provide where noted and/or required by code.
- B. Trap primer shall be located above accessible ceilings or located in wall using a lockable valve box. All related piping shall be concealed above finished ceiling, behind finished wall and below finished floor.

2.3 FLOOR DRAINS:

- A. 3" size with 7" strainer, unless scheduled otherwise.
- B. Provide clamping collar wherever floor structure has waterproof membrane except not in slab-on-grade. In ceramic or quarry tile floors, provide a 36" x 36", 4 lb. lead apron and secure to drain clamping ring. Refer to architectural drawings for areas with membrane.
- C. Set and anchor floor drains to provide minimum pitch of 1/16" per foot toward drain rim.
- D. On drains where drain body is caulked to waste pipe, use neoprene gasket, ASTM #C-564.

2.4 DRIP PANS:

- A. Where water and drain pipes pass over electrical equipment, provide drip pans of size as required (minimum 12" wide) to protect affected areas.
- B. Pans, 18 gauge galvanized sheet metal, edges turned up 2-1/2" on all sides, reinforced by rolling edge. Insulate exterior surface of drip pan with Armaflex sheet insulation.
- C. Provide 1-1/4" drain (schedule 40 PVC or Type "M" copper) to above nearest floor drain.

PART 3 - EXECUTION:

- 3.1 Note drawing details for installation arrangements.
- 3.2 All lines shall maintain uniform grades from each low point to the adjacent high points.
- 3.3 All lines shall be installed so that they can be vented and drained completely.
- 3.4 Unless noted, provide manual vents at high points and manual drains at low points. The intent is that all piping can be vented and/or drained.

END OF SECTION

SECTION 22 16 00

FUEL GAS PIPING SYSTEM

PART 1 - GENERAL:

1.1 WORK INCLUDED:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Basic Materials and Methods, Section 22 01 05.

PART 2 – PRODUCTS:

2.1 MATERIALS:

- A. Pipe above grade: black steel, Schedule 40, ASTM A-53 or A-106, Grade B (up to 2”), Grade A (larger than 2”).
- B. Fittings: Up to 2”; malleable; 2-1/2” and over, welded, ground joint unions and AGA cocks and ordinances.

2.2 PRESSURE REGULATORS, COCKS & VALVES:

- A. Regulators: minimum lock-up with either high or low inlet pressures.
- B. Regulator shall be size and type required by inlet-outlet pressures and flow rate; use Fisher as standard of quality required.
- C. Pressure regulators for appliances and/or equipment service shall have: balanced valve design, main diaphragm, of BUNA N with dacron insert, replaceable spherical BUNA H valve seat discs, cast iron pipe section, and aluminum diaphragm chamber.
- D. Shut-off cocks: semi-steel, lubricated plug type with double ball checks to prevent backpressure on sealant, similar to Rockwell-Nordstrom, short pattern: Figure No. I 114 for 1/2” and 3/4” sizes; Figure No. 142 for 1”-1 1/2”; Figure No. 143 for 2” and larger.
- E. F.M. approved checking cocks similar to Rockwell-Nordstrom No. 114 FM for sizes 1/2” and 3/4”; No. 115 FM for sizes 1” to 4”.
- F. All appliances using gas shall be equipped with 100% pilot safety valves.

PART 3 – EXECUTION:

3.1 INSTALLATION:

- A. Conform to requirements of (1) the gas utility, (2) NFPA Pamphlet 54, “Standard for Installation of Gas Piping and Gas Appliances in Buildings”, (3) applicable A.G.A. Codes and (4) Standard Gas Code.

- B. The installation of the service, cocks, and regulators shall be in accordance with the requirements of local gas utility. This contractor shall make arrangements for the service meter and regulator and pay all costs for the installation, inspection fees, tests, etc.
- C. The Contractor shall make arrangements with the gas utility to inspect the system and properly set all gas regulators in the piping system and pay all costs therewith. Furnish report to the Engineer.
- D. After completion and test of gas supply system, obtain certificate of approval from gas utility. Provide 2 copies to Engineer.
- E. Gas piping shall have minimum pitch of 1" in 40'.
- F. Provide drips at least 12" long with tee, nipple cap at bottom of risers and at low points. Take branches from top, or side, of horizontal pipes, not from bottom. Do not bend pipes. Use standard fittings for changes in direction. Weld all pipe 2-1/2" and larger and all concealed piping regardless of size.
- G. Conceal piping in finished areas where possible and permitted by Code. Do not run in or thru vertical chases such as air ducts, etc. Install gas pipes parallel to other lines; keep at least 12" away from hot lines, at least 6" above floor.
- H. Where gas-burning units are located adjacent to each other, provide manifold for group with both ends connected to distribution system.
- I. When gas-burning units are located adjacent to each other, provide manifold for group with both ends connected to distribution system.
- J. Provide shut-off cocks on: gas mains, risers, branches where indicated, and at connections to gas-burning appliances whether or not indicated.
- K. Regulators and control valves required access to atmosphere for proper operation shall be equipped with vent piping leading to outside building, or into combustion chamber adjacent to a burning pilot.
- L. Cap all appliance gas pipe outlets and make gas-tight until connected to gas appliances. Extend 1" thru walls and ceilings, 2" above floors.
- M. All gas piping below slab, inside building, shall be installed inside of a larger pipe vented to outside of building. Gas pipe shall not be installed in solid masonry or concrete floors or walls.
- N. Pipe joints underground shall be protected similar to piping. Cleaning pipe free of dirt, oil, rust, etc. and applying Royston "Roskote No. A-938 Mastic" to a final film thickness of 30 mils. This film-thickness shall require 2 or 3 coats of mastic brushed on.
- O. All gas piping above ground in or out of building, concealed or exposed, shall be painted yellow.

3.2 TESTS:

- A. Test and complete installation per utility requirements.
- B. Test all mains and/or high pressure piping at 50 psig for 2 hours.
- C. Test all low pressure piping under pressure of 12" of mercury for 2 hours.

- D. For all testing use air, do not use any liquid or oxygen.
- E. When ordered to turn on gas, check for leakage using utility meter.

END OF SECTION

SECTION 22 30 00

PLUMBING EQUIPMENT (WATER HEATER)

PART 1 - GENERAL:

1.1 DESCRIPTION OF WORK:

- A. Provide labor, material, equipment, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.
- B. Examine carefully architectural, equipment, electrical, mechanical and structural drawings and each division of this specification for items not a part of this plumbing section, which may require plumbing connections. Unless explicitly indicated to the contrary, Contractor shall provide necessary supply, waste and vent lines, and make final connections to such items. It shall be Contractor's responsibility to locate supply, waste and vent lines to such items in conformity with approved manufacturer's rough-in drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. General Provisions, Section 22 01 01.
- B. Completion Items, Section 22 01 03.
- C. Guaranty and Warranty, Section 22 01 04.
- D. Basic Materials and Methods Section 22 01 05.
- E. Plumbing Piping Insulation, Section 22 07 19.
- F. Domestic Water Piping Specialties, Section 22 11 19.
- G. Plumbing Fixtures, Section 22 40 00.
- H. Fixtures, Institutional, Section 22 46 13.
- I. Industrial Compressed Air Piping, Section 15 70 04.
- J. Bottled Gas, Tanks, Control & Piping. Section 15 70 05.

1.3 HOT WATER HEATERS:

- A. General:
 - 1. Units which exceed any one of the following limitations shall meet ASME construction code requirements and shall be so stamped:
 - a. 200,000 BTUH input
 - b. 120 gallons nominal capacity
 - c. 200°F temperature
 - d. 58 KW input
 - 2. All heaters shall be equipped with an energy shut-off device to cut off energy supply at 180°F leaving water temperature.
 - 3. All heaters shall be factory tested at 250 psig and warranted for 150 psig working pressure

PART 2 - PRODUCTS:

2.1 HOT WATER HEATER, ELECTRIC:

- A. Water heaters listed by Underwriters Laboratories as automatic storage type.
- B. Tanks: completely line with vitreous porcelain enamel; test at 250 psig; design for 150 psi working pressure; furnish factory installed magnesium anodes.
- C. Provide factory installed, high limit, temperature controls (energy cut-off), and one for each heating element. Water temperature control system: surface mounted, automatic, snap-action thermostats, and one for each immersion type-heating element.
- D. Tank insulation: 2" thick, glass-fiber insulation within steel jackets.
- E. Heating element: "N" chrome wire, imbedded in magnesium oxide, sealed in a tinned copper tube.
- F. Units shall have 3/4" drain valves.
- G. Dip tubes shall be anti-siphon type, either polysulfone or stainless steel.
- H. Units shall carry a manufacturers 5-year warranty, non-prorated.
- I. Verify voltage available with electrical drawings.

2.2 TEMPERATURE CONTROL:

- A. Provide thermostatic temperature control for each unit.
- B. For electric units, thermostat shall control contactor in power circuit.
- C. Provide 3-way adjustable set point, mixing valve assembly where shown. Sizes 0-2" shall be self-contained using hydraulic thermostatic element for insertion in tempered water line and connected to operating bellows by flexible armored tubing.

PART 3 - EXECUTION:

- 3.1 Install all equipment per manufacturers recommendation.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL:

1.1 DESCRIPTION OF WORK:

- A. Provide all labor, material, equipment, etc. required to complete fixture installation as specified herein and/or scheduled on the drawings.
- B. Examine carefully architectural, equipment, electrical, mechanical and structural drawings and each division of this specification for items not a part of this plumbing section, which may require plumbing connections. Unless explicitly indicated to the contrary, Contractor shall provide necessary supply, waste and vent lines, and make final connections to such items. It shall be Contractor's responsibility to locate supply, waste and vent lines, to such items in conformity with approved manufacturer's rough-in drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. General Provisions Section 22 01 01.
- B. Basic Materials and Methods Section 22 01 05.
- C. Sanitary Waste and Vent Piping Section 22 13 16.
- D. Sanitary Waste Piping Specialties, Section 22 13 19.
- E. Hangers and Supports for Plumbing Piping and Equipment, Section 22 05 29.
- F. Plumbing Piping Insulation Section 22 07 19
- G. Domestic Water Piping, Section 22 11 16
- H. Facility Water Distribution Piping, Section 22 11 13
- I. Sanitary Waste Piping Specialties, Section 22 13 19.
- J. Plumbing Fixture, Section 22 40 00.
- K. Plumbing Equipment, Section 22 30 00.
- L. Electrical Connections, Division 26.

PART 2 - PRODUCTS:

2.1 FIXTURES:

- A. Wherever a catalogue number is scheduled, it is intended that all material covered by this catalogue number and any required accessories shall be furnished.

- B. All exposed metal trim and piping shall be chrome-plated and polished.
- C. Trim which can be removed, or disassembled, without tools is not acceptable.
- D. Water closet seats shall be open front, elongated style with self-sustaining and concealed hinge, less cover, of solid urea formaldehyde, fire proof plastic, unless noted otherwise in plumbing fixture schedule.
- E. All water closets shall flush with 1.6 gallons or less and meet ANSI A112.19.2M Standards.

2.2 TRIM:

- A. Flush valves shall meet Fed. No. WW-P-541 and shall have: screwdriver control stop, vacuum breaker, adjustable tailpiece, non-hold open handle, and optional equipment as scheduled. Flush valves shall be compatible with water closet and use 1.6 gallons or less per flush.
- B. Provide closets with bolt caps with retainer clips. Use all mineral gasket with plastic discharge sleeve having ethane core reinforcement.
- C. Closet floor flanges shall be C.I., 1/4" thick with 2" caulking depth.
- D. Lavatory and sink faucets shall be provided with 2 GPM flow restrictors on hot and cold water, unless otherwise specified.
- E. Traps shall be cast brass with cleanout. Supplies shall be flexible chrome-plated brass or copper with heavy duty 1/2" x 3/8" stop.
- F. Trim for handicap fixtures shall meet ANSI A117.1

2.3 HYDRANTS:

- A. Freeze-proof: anti-siphon with integral backflow preventer, all bronze interior parts, bronze casing and non-turning operator rod with free floating compression closure valve. Nickel bronze faceplate with operating key. Must be able to replace seat through front face of hydrant.

2.4 ELECTRIC WATER COOLER:

- A. Capacity scheduled is based on 80-degree inlet of water, 50-degree drinking water, and 90-degree ambient temperature.
- B. Entire outside top shall be polished 18-8 stainless steel with full-length anti-splash ride. Unit shall have: strainer, pre-cooler with guard, stream control valve and regulator for supply pressure from 20 to 125 psig. All exposed hardware shall be chrome-plated or S.S. cabinet finish shall be per schedule.
- C. Cooling tank shall be copper with copper refrigerant coil bonded to exterior and assembly hot tin dipped after assembly. Temperature controlled by adjustable thermostat.
- D. All surfaces which potable water touches shall be: copper, brass, stainless steel, teflon, or rubber compound.
- E. Unit shall meet A.R.I. #1010 Standard, and shall carry a full 5-year warranty.

2.5 SERVICE BASIN & SHOWER RECEPTOR, PRE-CAST TERRAZZO:

- A. Pre-cast, one piece, genuine terrazzo having a compressive strength of 3,000 PSI seven days after casting. Any air holes and pits shall be grouted and entire unit ground and polished. Provide S.S. flange extending 1-1/2" above shoulder for wall attachment. Receptor shall be rabbetted for marble, or flanged for tile, as required.

PART 3 - EXECUTION:

3.1 SUPPORTS:

- A. Support wall-hung fixtures: (1) from steel studs with steel plates secured to studs per detail, (2) from masonry with thru-bolts, (3) from carriers where noted, and (4) wall hung water closets shall be supported by carriers.
- B. All fixtures designed for handicap use shall be mounted at handicap height as indicated by handicap code used in local area.
- C. At sinks and lavatories for handicapped, use offset P-traps to maximize knee space. Insulate exposed HW and CW water piping with 1" fiberglass insulation per Section 22 07 19.

3.2 FIXTURE CONNECTIONS:

- A. Connect to plumbing fixtures and equipment provided under this and other sections of specifications.
- B. See schedule on plans for connections sizes to fixtures.
- C. Connect wall-hung urinals to waste piping with red brass nipples.
- D. Each fixture, floor drain, and piece of equipment requiring connection to drainage system to have separate traps installed as close to fixture as possible.
- E. Provide deep seal P-traps under floor drains.

3.3 CLEANING AND TESTING:

- A. Test plumbing systems in accordance with test procedures and pressure as specified in Section 22 11 13.
- B. Clean and sterilize domestic water supply in accordance with test procedures as specified in Section 22 11 13.

3.4 VALVES:

- A. Provide shut-off valves at all water connections to fixtures, equipment, etc.

END OF SECTION

SECTION 23 01 01

MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, material, etc. required to complete installation specified herein and/or shown or scheduled on the drawings.
- B. Equipment and materials used in the work shall be in accordance with the contract documents, of the best quality and grade for the use intended, shall be new and unused and shall be the manufacturer's latest standard or current model for which replacement parts are readily available.
- C. All apparatus and equipment shall be installed and connected in accordance with the best engineering practices and in accordance with the manufacturer's recommendations. All auxiliary piping, water seals, valves, electrical connections, etc., recommended by the manufacturer or required for proper operation shall be furnished and installed complete.

1.2 SPECIAL CONDITIONS, MECHANICAL:

- A. By the act of submitting a bid, this Contractor agrees that all of the "Contract Documents" and each of the Divisions of the complete specifications have been reviewed and studied, and all requirements and coordination resulting there from are included.
- B. In this section, the word "Contractor" means the Mechanical Contractor. The word "provide" means furnish, install and connect.
- C. Do not scale drawings having 1/4" or smaller scale. Because of small scale, it is not possible to indicate all offsets, fittings, and accessories; provide such as are required for complete installation.
- D. The right is reserved to move any element as much as ten (10) feet at no increase in cost provided Contractor is notified before work in question is installed.
- E. Contractor shall be responsible for determining and verifying the characteristics of electrical current available to operate the mechanical equipment prior to ordering such equipment.
- F. Contractor shall be responsible for reviewing all drawings (Architectural, Mechanical, Electrical, Structural etc.). If any discrepancies are discovered between drawings, the contractor shall notify the Architect/Engineer prior to bidding so that an addendum may be issued for clarification.

1.3 CODES AND STANDARDS:

- A. The intent is that the complete installation shall comply with applicable laws and ordinances, utility company regulations, and applicable requirements of the following:
 - 1. International: Building Code, Gas Code, Mechanical Code, and Plumbing Code.
 - 2. NFPA: National Fire Protection Association.
 - 3. National Plumbing Code
 - 4. AGA: American Gas Association.

5. FM: Association of Factory Mutual Fire Insurance Company.
6. ASME: American Society of Mechanical Engineers.
7. ASTM: American Society of Testing Materials.
8. NSF: National Sanitary Foundation.
9. PDI: Plumbing Drainage Institute.
10. UL: Underwriters Laboratories.
11. NEC: National Electrical Code.
12. NEMA: National Electrical Manufacturer's Association.
13. SMACNA: Sheet Metal and Air Conditioning Contractors National Association.
14. ARI: American Refrigeration Institute.
15. PFMA: Power Fan Manufacturer's Association.
16. MSS: Manufacturer's Standard Society of Valve and Fittings Ind.
17. ANSI: American National Standard Institute.
18. API: American Petroleum Institute.
19. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers.
20. Tennessee Energy Code.
21. TOSHA: Tennessee Occupational Safety & Health Act.

1.4 COORDINATION OF WORK:

- A. Furnish and locate required anchor bolts, sleeves, inserts, supports, etc.
- B. Lines which pitch shall have right-of-way over lines whose elevations can be changed. Offsets, transitions and changes in direction in pipe and ducts shall be made as required to maintain proper headroom, pitch, etc.
- C. Coordinate all ducts, outlets, fixtures, etc. with floor, wall and ceiling patterns.
- D. The mechanical work shall be installed as neatly as possible in the locations shown but shall be subject to such deviations, modifications and relocations as may be necessary to conform to the requirements of the architectural drawings and as necessary to avoid interferences with the structural work and the work of other trades, and interferences between the various trades. This shall be done at no cost to the Owner. No ductwork, piping or equipment shall be installed which would require ceilings to be lower than required by drawings, unless approval is obtained from the Architect.
- E. If necessary to coordinate and expedite the work, the Contractor shall prepare "interference drawings" and submit them to the Architect for approval. Such drawings shall show the work of the various trades involved, illustrate proposed details of construction and arrangement of equipment and apparatus, and clearly indicate any deviations from contract requirements.
- F. Minor changes in arrangement may be made to suit unforeseen conditions, but no major deviation shall be made without written approval from the Architect. If any deviations are deemed necessary, submit all details of proposed changes and all reasons therefore, in writing, to the Architect for approval prior to making installation of such work.
- G. Contractor shall coordinate requirements for utility connections with municipal utility departments and utility companies. Installation of service taps, extensions, valves and metering provisions shall comply with criteria of appropriate authority, and any cost associated therewith shall be included in the bid amount.

1.5 DATA AND SHOP DRAWINGS:

- A. Prior to ordering, submit certified prints and/or descriptive data for major pieces of equipment, fixtures, valves, insulation, controls, etc. Stamp, sign and certify to be correct and in compliance with the Contract Documents, each drawing submitted for review. Drawing submitted without signed certification will be returned without review.
- B. Any deviation in submittal from contract documents of materials, capacities, space requirements in items furnished, etc. shall be listed in a letter accompanying submittal stating deviation and reason requested for consideration of acceptance.
- C. Submittals shall be bound in a 3 ring binder, clearly marked, and in order as indicated on drawings. Items submitted partially and in an unorganized manner shall be returned without review.
- D. Submittal shall show: manufacturer's catalog number, performance data with indicated operating points, finishes, optional features and modifications. Each sheet of printed submittal data shall be clearly marked (using arrows, underlining, or circling) to show the particular size, type, model number, ratings and options actually being proposed.
- E. When work in accordance with manufacturer's recommendation is specified, a copy of recommendations shall be kept in the job office.
- F. Furnish the number of copies required by the General and Special conditions of the contract but in no case less than six (6) copies.
- G. Shop drawings shall show sizes and details of required concrete and steel machine foundation, location of anchor bolts, physical dimension of equipment, equipment weight or other pertinent data required for equipment support or installation.
- H. Approved shop drawings do not mean that drawings have been checked in detail; said approval does not in any way relieve the contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings or specifications.

PART 2 - PRODUCTS:

2.1 REFERENCE TO DRAWINGS:

- A. Reference shall be made to drawing schedules and details for: manufacturer, model, catalog number, size, capacity, performance, installation, etc. of equipment and material. Equipment of manufacturers other than those named, will be acceptable provided, in the opinion of the Engineer, it is of equal substance, function, performance and appearance.

2.2 CHOICE OF MATERIALS AND EQUIPMENT:

- A. In submitting substitutions, bidders should note the following minimum considerations: (1) capacities shown are absolute minimum and must be equaled, (2) physical size limitation for space allotted, (3) static and dynamic weight limitation (4) structural properties, (5) noise level, (6) vibration generation, (7) interchangeability, (8) accessibility for maintenance and replacement, (9) compatibility with other materials, assemblies, and (10) similar items shall be same manufacturer and style wherever possible.

- B. All material and equipment, for which a UL Standard, an AGA approval, or an ASME requirement is established, shall be so approved and labeled or stamped. Label or stamp shall be conspicuous and not covered, painted or otherwise obscured from visual inspection.
- C. Adhesives are not acceptable as a mounting, supporting, or assembling technique.
- D. Contractor shall pay any costs added to total contract as a result of any substitutions.
- E. Equipment, etc. shall not be purchased without Engineer's written approval.

PART 3 - EXECUTION:

3.1 EXISTING SERVICES:

- A. No service shall be interrupted without permission of the Owner. Owner must receive written request a minimum of 72 hours in advance of any anticipated shutdown.
- B. When encountered in work, protect existing active: sewer, water, gas, electric, other utility services, structures; when required for proper execution of work, relocate them as directed. If existing active services are not indicated, request Engineer for instructions.
- C. When encountered in work, whether or not indicated, cap or plug to otherwise discontinue existing inactive: sewer, water, gas, electric, other utility services, structures which interfere with work execution. Notify Engineer in writing of action taken. If removal is required, request instructions.

3.2 DRAWINGS:

- A. Drawings are diagrammatic. Contractor shall install the work in such manner that the equipment, piping, vents, conduit, panels, ductwork, etc. will fit in space provided, maintain headroom, and if in finished areas, be as neatly installed and "out-of-the-way" as physically possible. All equipment, piping, ductwork, conduits, etc., shall be installed to provide needed maintenance and passage space.

3.3 FEES:

- A. The contractor shall pay for fees and inspections as may be required for water and sanitary sewers, gas service, sprinkler systems, and all other systems requiring inspections by agencies having jurisdiction.

3.4 INSPECTION OF SITE:

- A. The drawings are prepared from the best information available and reflect the conditions commensurate with this information. However, the Contractor shall visit the site prior to submitting a proposal and shall verify the locations, sizes, depth, pressures, etc., of all existing utilities; and familiarize himself with working conditions, hazards, existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair the proper operation of the utilities, or the construction process, the Architect shall be notified in writing.
- B. All proposals shall take these existing conditions and any revisions required into account, and the lack of specific site information on the drawings shall not relieve the Contractor of his responsibility.

END OF SECTION

SECTION 23 01 02

HVAC AND ELECTRICAL COORDINATION

PART 1 - GENERAL:

1.1 RELATED DOCUMENTS:

- A. Refer to Section 23 01 01 – General Requirements for Mechanical Work.

1.2 SUMMARY:

- A. This Section describes the coordination between the Mechanical, Fire Protection, Plumbing, and Electrical portions of the work.
- B. This Section is included under the Division 21 and 26 portions of the specifications.

1.3 WORK INCLUDED:

- A. Responsibility: Unless otherwise indicated, motors and controls shall be furnished, set in place and wired in accordance with the following schedule. This schedule may include equipment and systems that are not required for this project. Only the equipment and systems that are required on the drawings and/or specified elsewhere will be required by this section:

| <u>ITEM</u> | <u>FURNISHED UNDER DIVISION</u> | <u>INSTALLED UNDER DIVISION</u> | <u>WIRED AND CONNECTED UNDER DIVISION</u> |
|--|---|---|---|
| 1. Equipment Motors | 23 | 23 | 26 |
| 2. Magnetic Motor Starters: | | | |
| a. Automatically controlled, with or without HOA switches | 23 | 26 | Notes 1,3 |
| b. Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment | 23 | 23 | Notes 1,2 |
| c. Manually controlled | 23 | 26 | Notes 1,3 |
| d. Manually controlled and furnished as part of factory wired equipment | 23 | 23 | Notes 1,3 |
| e. Furnished in Motor Control Centers | 26 | 26 | Notes 1,3 |
| 3. Line voltage thermostats, time clocks etc., not connected to control panel systems. | 23 | 26 | 26 |

| <u>ITEM</u> | <u>FURNISHED UNDER DIVISION</u> | <u>INSTALLED UNDER DIVISION</u> | <u>WIRED AND CONNECTED UNDER DIVISION</u> |
|--|---|---|---|
| 4. Electric thermostats, time clocks, remote bulb thermostats, motorized valves, float controls, etc. which are an integral part or directly attached to ducts, pipes, etc. | 23 | 23 | 23 |
| 5. Temperature control panels and time switches mounted on temperature control panels. | 23 | 23 | 23 |
| 6. Motorized valves, motorized dampers solenoid valves, EP and switches, etc. | 23 | 23 | 23 |
| 7. Alarm bells furnished with equipment installed by Division 23. | 23 | 23 | 23 |
| 8. Wiring to obtain power for control circuits, including circuit breaker. | 26 | 26 | 26 |
| 9. Low voltage controls, thermostats valves, dampers, etc. | 23 | 23 | 23 |
| 10. Fire protection system (sprinkler) controls. | 21 | 21 | 26 |
| 11. Fire and smoke detectors installed on mechanical units and in ductwork. | 26 | 23 | Note 2 |
| 12. All relays required for fan shutdown, motorized dampers, smoke control devices, and other items integral with HVAC equipment to provide operation and control of HVAC equipment. | 23 | 23 | 23 |
| 13. Pushbutton stations, pilot lights | 23 | 23 | 23 |
| 14. Heat Tape | 23 | 23 | 26 |
| 15. Disconnect switches, manual operating switches furnished as a part of the equipment. | 23 | 23 | Note 1 |
| 16. Disconnect switches, manual operating switches furnished separate from equipment. | 26 | 26 | 26 |
| 17. Multi-speed switches | 23 | 23 | 26 |
| 18. Thermal overloads | 23 | 23 | 26 |

| <u>ITEM</u> | <u>FURNISHED UNDER DIVISION</u> | <u>INSTALLED UNDER DIVISION</u> | <u>WIRED AND CONNECTED UNDER DIVISION</u> |
|--|---|---|---|
| 19. Control relays, transformers | 23 | 23 | 26 |
| 20. Tamper switches for fire protection (sprinkler) system. | 21 | 21 | 26 |
| 21. Flow switches for fire protection (sprinkler) system. | 21 | 21 | 26 |
| 22. Alarm bells or horns for fire protection (sprinkler) system. | 21 | 21 | 26 |
| 23. Underground fuel tank leak detection and monitoring system. | 22 | 22 | 26 |

NOTES:

- (1) Power wiring as defined in Section 26 05 13 of the specifications shall be under Division 26; control wiring as defined in Section 26 05 13 of the specifications shall be under Division 23.
 - (2) Wiring from alarm contacts to alarm system by Division 26; wiring from auxiliary contacts to air handling system controls by Division 23. Division 26 shall provide power to smoke detector. Smoke detectors required for supply duct and return air duct for all air handling systems 2000 CFM or greater. Refer to other Division specifications and drawings for more specific requirements.
 - (3) For requirements for Magnetic Motor Starters, refer to Division 23, Section 23 01 01 – General Requirements for Mechanical Work.
 - (4) Disconnect switches, operating switches, starters and other similar items, which are factory-mounted, as a part of a complete assembly, shall comply with applicable provisions of the National Electric Code. All such disconnect switches shall be fused.
- B. Connections: Make all connections to controls, which are directly attached to ducts, piping and mechanical equipment with flexible connections.
- C. Precedence:
1. In general, piping systems, which require a stated grade for proper operation, shall have precedence over systems.
 2. Precedence for pipe, conduit and duct systems shall be as follows:
 - a. Building lines
 - b. Structural members
 - c. Soil and drain piping
 - d. Vent piping
 - e. Refrigerant piping
 - f. Condensate piping
 - g. Supply ductwork
 - h. Exhaust ductwork
 - i. Automatic fire protection sprinkler piping
 - j. Domestic hot and cold water piping

- k. Natural gas piping
- l. Electrical conduit

3. Lighting fixtures shall have precedence over air grilles and diffusers.

D. Final Inspection and Report:

At the completion of the work, there shall be a meeting of the mechanical, electrical and temperature control contractors, representatives of mechanical and electrical equipment manufacturers whose equipment was actually installed on the project, and similarly-involved individuals, who shall thoroughly inspect all systems, and who shall mutually agree that all equipment has been properly wired and installed, and that all temperature and safety controls are properly functioning. A written report of this meeting, listing those in attendance, and the companies, which they represent, shall be filed with the Owner and Architect/Engineer.

END OF SECTION

SECTION 23 01 03

COMPLETION ITEMS

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

1.2 CONNECTION TO EQUIPMENT:

- A. Work shall include all labor, material, equipment, etc. required including, but not limited to, the following: (1) provide steam supply and return, chilled water supply and return, heating hot water supply and return, refrigerant piping, domestic hot and cold water supply, drain, vent, gas, etc., and (2) connections to all equipment specified in this or other sections requiring such services.
- B. Indicated locations and sizes of equipment connections are approximate; exact locations and sizes of piping, valves, etc. shall conform to approved shop drawings. Connection sizes shall not be smaller than scheduled size or equipment outlet size, whichever is larger.
- C. Equipment furnished by other sections shall be properly equipped structurally and mechanically with all accessories, including plumbing, piping, drains, traps, tailpieces, supply fittings, ductwork, gas lines, etc., internal to and part of the equipment installed by the equipment manufacturer or supplier, ready to receive single connections for each of the various mechanical items, except that this Division shall furnish shut-off valves and unions or flanges.
- D. Where existing equipment is removed, disconnect and cap lines, behind or below finished building surfaces.
- E. Verify all connections and rough-in locations with the Architect and/or the equipment supplier or contractor prior to the start of their work.

1.3 ADJUSTING AND TESTING:

- A. Before testing, protect from damage any control and indicating devices, etc. not designed to stand test pressures. Test all elements before covering or "closing in".
- B. Provide labor, material, instruments, fuel, electricity, water and other costs in connection with all tests. Installed instruments may be used for tests if calibrated and approved for the purpose.
- C. Conduct pressure, temperature, ampere, voltage, performance and operating tests for each system, equipment, unit motor, etc. as directed by and in presence of Engineer. Submit tabulation showing: (1) nameplate amperes and voltages, (2) actual full-load amperes and voltage for each phase of every motor, (3) overload element number and rating, (4) CFM for each air intake and outlet including O.A. and exhaust with actual reading obtained, (5) each fan RPM, (6) static pressures entering and leaving each fan, (7) water pressures in and out of each pump and, (8) water flow at each pump. See Section 23 05 93 for additional test and balance requirements.

- D. Test all piping, except refrigeration, air and oil, hydrostatically to 1.5 times maximum working pressure, but in no case less than 125 PSIG, for at least 4 hours. Subject welded joints to hammer test while under pressure. Caulking or peening repairs not permitted.
- E. Obtain certificates of approval, acceptance and compliance with regulations from agencies having jurisdiction.

PART 2 - PRODUCTS:

2.1 RECORD AND AS-BUILT DOCUMENTS:

- A. Maintain at job site a set of contract record documents kept current by indicating thereon all changes, substitutions, etc. between work as specified and as installed.
- B. Furnish Engineer one (1) complete set of electronic drawing files showing installed location, size, etc. of all work and material in .pdf and .dwg format.
- C. Show on record documents actual air quantities, water flow rates, valve or damper positions after balancing, etc.; also show, by actual dimension, location of all underground work.
- D. For each piece of equipment, provide the owner three (3) sets of: (1) manufacturer's printed catalog pages, operating and maintenance instructions, wiring and connection diagram, etc., (2) temperature-humidity and motor interlock control and wiring diagrams showing operation instructions for, and normal position of, each motor and controller, control valve, thermostat, etc., and (3) lubrication chart. Bind this information into 8-1/2" x 11" booklets. All three (3) sets shall be assembled in hardback binders.

PART 3 - EXECUTION:

3.1 OPERATING INSTRUCTIONS:

- A. Furnish to the Architect written operating and maintenance instructions for each system and each piece of equipment. Include in equipment data binder specified above: (1) instructions to start and stop each piece of equipment, (2) itemized maintenance schedule, (3) submittals.
- B. When systems are completely adjusted, furnish personnel for five (5) full days to instruct Owner's operators. When Owner operates on a 24-hour basis, each shift shall be properly trained.

3.2 CLEANING AND FLUSHING:

- A. Fixtures, Equipment, Etc.
 - 1. Fixtures, piping, ducts, equipment, etc. shall be cleaned per manufacturer's printed instructions and Engineer's instructions.
 - 2. No air unit shall be operated without a construction set of specified type filters being installed.
- B. Before final building interior finish is applied:
 - 1. Interior of air handling equipment shall be thoroughly cleaned.
 - 2. Drain pans shall be cleaned and then flushed with water after which, run all fans with air terminals out, put filters in place for 24 hours.

C. Clean-Up of Piping:

1. Piping shall be: (1) flushed with clean water, (2) "blown out" with steam or compressed air, or (3) "swabbed out" as required, except where specified otherwise. All temporary connections required for flushing shall be provided and subsequently removed by the Contractor.
2. Care shall be exercised by contractor to prevent any other foreign matter from entering pipe or components of system during construction. Plug pipe ends or cover with burlap, or other material to keep out foreign materials. Before erection, each piece of pipe, fitting or valve shall be visually examined and all dirt or other foreign matter removed.
3. Connect all equipment with fine mesh strainer in place and spools to bypass coil in fan coil units to prevent foreign matter from entering coils. With system filled, trapped air vented, check system to determine that no leaks exist. Any leaks in piping shall be repaired before proceeding. Pipe shall be opened at lowest points and highest points for initial flush and blow down, making sure makeup water fill valves are set to make up water at same rate of drainage. Check pressure gauge at pump suction and manually adjust makeup to hold same steady positive pressure before and after opening drain. Flushing shall continue until water is clean after opening drain points. In no case shall flushing period be less than two (2) hours. Provide temporary hoses on pipes as necessary to thoroughly flush all parts of system. Drain system.

D. System Start-up Cleaning and Flush:

1. Fill system at city water makeup connection, with all air vents open. After filling with air vented, vents shall be closed.
2. Start pump with pressure reducing valve set for test pressure or for maximum for pump casing whichever is smaller. Vents shall be checked in sequence to bleed off any trapped air until there is circulation through all components of system. Open control valves in sequence for complete system circulation.
3. All vents shall be opened and pipe opened at valves and low points to completely drain system.
4. After system is drained it shall be refilled for operation under closed conditions. Contractor shall add a chemical cleanup solution to the system, the pump started, trapped air vents, drains closed, and control valves opened. Solution shall circulate for approximately 24 hours. Mechanical Engineer shall be given notice of this cleaning operation and will be present to observe the cleaning operation. If the engineer deems it necessary, the cleaning operation shall be repeated.
5. After system cleanout is completed, drain system and install flow control devices, coarse mesh strainers and connections to all coils. The fine mesh strainers at the pumps shall be removed and coarse mesh strainers installed. Refill system and make ready for operation and operating water treatment.

3.3 PAINING:

- A. All equipment shall present a clean, painted appearance; touch-up, or repair, as required.
- B. All gas piping above ground, in or out of building, concealed or exposed, shall be painted yellow.
- C. Paint all equipment and other ferrous metal, which is not otherwise protected against corrosion. Paint exposed pipe threads with Bitumastic #50. Clean thoroughly all surfaces before painting.
- D. Where ductwork can be seen through grilles, louvers, etc. paint the visible areas with flat black paint.

3.4 LUBRICATION:

- A. During construction, all bearings and shafts shall be kept thoroughly greased and protected. All rotating equipment (fans, pumps, etc.) shall be turned by hand or by "bumping" the starter at least once a week during construction.
- B. After equipment has been operated seven (7) days and before final acceptance, all bearings shall be inspected and filled to operating level.

3.5 TESTING AND BALANCING AIR DISTRIBUTION & HYDRONIC SYSTEMS:

- A. See Section 23 05 93.

3.6 QUIETNESS OF OPERATION:

- A. Pumps, fans, motors and other apparatus shall be selected and installed for reasonably quiet operation. Any objectionable noise, which develops, shall be corrected before the work will be accepted. Equipment, which produces objectionable noise, shall be adjusted or insulated so as to eliminate the noise, or shall be removed and replaced by satisfactory equipment. Provide spring or rubber machine mounting isolators and flexible piping and duct connections where necessary to prevent transmission of vibration to building structure or to piping and duct system. Refer to Section 20 05 16 for requirements and type.

END OF SECTION

SECTION 23 01 04

HVAC GUARANTEE AND WARRANTY

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

1.2 TEST PERIOD: Each piece of equipment shall meet performance specifications after one (1) year's actual operation.

PART 2 - PRODUCTS:

Not used.

PART 3 - EXECUTION:

3.1 The Contractor shall replace, or make good, any defect due to faulty workmanship or material, which shall develop within one (1) year from date of acceptance at no cost of Owner. This guarantee shall cover both material and labor and shall include: (1) refrigerant and oil replacement, (2) any adjustments or service required, and (3) any necessary adjustments in system control set points when required, but no filter maintenance. The Contractor is responsible to replace work found not in conformance with the contract at any time during the life of the installation. Replacement of non-conforming work is not subject to the one-year warranty limitation.

3.2 Date of Acceptance shall be certified by the Engineer as that date on which the contract has been satisfactorily completed in accord with Contract Documents. If a whole or partial system, or equipment is put into use for benefit of any party, other than contractor and with prior written permission of the Owner, this agreed date shall become the "Date of Acceptance" for that piece of equipment or system.

3.3 CERTIFICATE: Prior to completion and final acceptance of the facility, furnish to the Engineer certification that the mechanical systems have been tested and that the installation and performance of those systems conform to the Contract Documents.

3.4 See other sections for additional warranty requirements.

END OF SECTION

SECTION 23 01 05

BASIC MATERIALS AND METHODS

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

PART 2 - PRODUCTS:

2.1 ELECTRICAL EQUIPMENT:

- A. Motor controllers, protective devices, etc. for control and protection of equipment shall be furnished with the equipment, but installed and electrically connected to power source under Division 26.
- B. NEMA Standards shall be taken as a minimum requirement for electrical equipment.
- C. Equipment shall operate properly under a 10% plus or minus voltage variation, and a 5% plus or minus frequency variation.
- D. Unless noted otherwise, motors shall be squirrel-cage induction type with ball bearings. Motors 1/2 HP and smaller shall be 120 volts, single phase with permanently lubricated bearings; 3/4 HP and larger shall be 3 phase, general purpose, Design "B" or "C", drip proof type. Verify characteristics of available current at the building before equipment is ordered.
- E. Motor shall be in accordance with IEE, UL and NEMA Standards, non-radio interfering type, rated for continuous, full-load duty and capable of withstanding momentary overloads of 50%. Select motors so actual loads does not exceed nameplate rating, and does not use motor "service factor". "Open" motors shall be rated 40 degrees C.; "totally enclosed" type shall be 50-degrees C. rated. Motors over 5 HP shall be "NEMA premium efficiency" type and so labeled, and in compliance with NEMA MG-1 Standards. Service factor for motors shall be 1.15.
- F. Provide both overload and under-voltage protection in all phases.
- G. Except where interlock or automatic control is required, single speed motors, 1/2 HP and smaller have manual switch with pilot light and thermal overload protection.
- H. For manual operation of 3/4 HP and larger motors, furnish magnetic starter with:
 - 1. Maintained contact PB and pilot light or momentary contact pushbutton station and pilot light.
 - 2. Trip free, thermal overload relays.
 - 3. Capable of accepting electrical interlocks.
- I. Where interlock or automatic operation is specified, regardless of HP, provide magnetic starter complete with "RUN/OFF/AUTO" switch so connected that in "RUN" or "AUTO" all safety controls shall stop the motor.

- J. All magnetic starters shall have control circuits individually fused from line side of starter, or load side of breaker. All starters on service 200 volts and above shall have 120 volt, built-in control circuit transformer fused on line and load side.
- K. Provide dual element fused disconnect for all hermetic motors above 3/4 HP.
- L. Heating Equipment: 1.8 KW and smaller, 120 volts; 1.81 KW through 4.7 KW, single phase; 4.8 KW and larger, 3 phase, voltage as noted or unless noted otherwise.
- M. Contactors shall be UL listed for 100,000 cycles of operation.
- N. Normal operation pilot lights shall be green; emergency condition signal lights shall be red.

2.2 EQUIPMENT ACCESSORIES:

- A. Provide removable guards to enclose all rotating or moving elements. Construct of galvanized steel to withstand 250 lbs. static load. Provide tachometer access to shaft ends.
- B. Design V-belt drives for overload per belt manufacturer's recommendations, but in no case less than 150% of motor horsepower.
- C. Note that fixed speed drives are specified. If final tests, under operating conditions, indicate the need for a different speed drive to accomplish the required load at the least power requirements, the Contractor shall provide the required drive changes at no extra cost.
- D. On direct-coupled drive equipment, dowel motor and driven equipment to a common base using 2 dowels each.

2.3 ACCESS PANELS:

- A. Provide access panels, or doors, at concealed dampers, valves, shock absorbers, vents, traps, trap primers, inspection points, etc. and where noted. Panels shall be galvanized steel, 16 gauge frame, 14 gauge door with mounting accessories, spring hinges, screwdriver operated lock, and prime coat paint. Milcor "A" for acoustic tile, "M" for exposed masonry, "K" for plaster finishes, stainless steel for ceramic, or glazed structural tile. Where ceiling is "lift out" construction, ceiling access panels are not required. Panels shall be 18" x 18" or larger, as required for service intended.
- B. Access doors giving access to "live" electrical gear shall have switch to cut off power when opened.
- C. Access panels in fire rated construction shall have a UL label, Class B rating.

2.4 ROOF MOUNTED EQUIPMENT: All roof-mounted equipment shall be furnished with a roof curb designed for flashing to roof and so designed to meet roof slope and make equipment level. Roof curbs shall be designed for Seismic Zone 2 and have an "R" rating from the state of California.

2.5 CONCRETE: Where required for thrust blocks, pipe system encasement, equipment bases, etc. for Division 23, provide 3,000-PSI concrete.

PART 3 - EXECUTION:

3.1 ELECTRICAL WORK:

- A. All electrical work shall be provided under "Electrical Division", except: that associated with Division 15, (1) that associated with interlock circuits, (2) control circuits, (3) temperature-humidity controls. For these excepted items, this division shall provide conduit, wiring, connections, etc. as required for a complete control installation.
- B. The work under this Division shall be of the same type and quality as specified under "Electrical Division".

3.2 EXCAVATION, SHORING AND BACKFILL:

- A. Provide any excavation required for this Division below that is needed for general construction. Unless specifically noted, no extra shall be paid if rock or excavation difficulties are encountered.
- B. Provide separate trench for each utility.
- C. Provide: (1) bracing, shoring, etc. to protect sides of excavation, (2) staging, suitable ladders, barricades, etc. Comply with local regulations, or absence thereof with Division of the Manual of Accident Prevention provided for in Construction of the AGC.
- D. When trench excavation is required to cross traffic areas, one-half of the traveled portion of the pavement must remain open to traffic at all times, unless a plan approved by the City Traffic Engineer permits otherwise.
- E. Existing pavements, bases, curbs and gutters and sidewalks shall be cut and brought to a straight, vertical edge by mechanically sawing. Expansion joints removed shall be replaced.
- F. Maximum trench width is as shown on plans or 1.5 feet + O.D. of pipe or cable.
- G. Minimum trench width shall be sufficient to permit thorough compaction of the bedding material under and around the pipe or cable.
- H. All soft or otherwise unsuitable material shall be removed from the trench bottom and replaced with compacted crushed stone or other approved material.
- I. Bedding materials shall be the superior of class shown on approved plans or clean washed stone of 3/4-inch maximum particle size. Bedding shall provide a minimum of 6-inches cover above the pipe or cable unless otherwise shown on approved plans. Stone shall be brought up evenly on both sides of the pipe in 6-inch layers and tamped, rodded, or vibrated as required to provide a firm base and bedding around the pipe or cable.
- J. Remove all timber before backfilling. Backfill simultaneously on both sides of tanks, piping, etc. Backfill material shall be approved clay or chert, free of debris, rock larger than 1"Ø or other harmful material.
- K. All backfilling shall be compacted to 90% under sidewalks, or grass areas, and to 95% when under paved areas, structures, building slabs, and steps. etc. These percentages refer to "Percent of Maximum Density" per ASTM #D-1557. If more stringent, compact backfill to a dry density equal to that required by G.C.

- L. Backfill material for utility cuts in City of Chattanooga Streets and extending 18 inches beyond edge of pavement or back of curb shall be mineral aggregate, class "A", grading "D", (previously "33P", or "pugmix") in accordance with TDOT specification. This backfill material shall be placed and compacted in 6-inch layers by means of a mechanical tamp to a density not less than 83 percent of the solid volume density as determined from the bulk specific gravity and the dry weight of the aggregate. Material that is too dry for adequate compaction shall receive a prior admix of sufficient water to secure optimum moisture content.
- M. Pavement shall be replaced in kind as shown on the city's standard drawings. The patch shall be finished so as to not leave a bump or dip in the finish grade.
- N. If permanent pavement repairs cannot be made within (2) days, then temporary replacement shall be made with 2-inches cold mix or hot bituminous seal coat. Permanent repair MUST be made within 10 workdays from date of pavement cut.
- O. Whenever trench openings are within state highways, the permit holder shall comply with all requirements and provisions of the Standard Method of the Tennessee Department of Transportation for opening trenches through highways and replacing pavements. All such work shall be subject to inspection and approval by the Tennessee Department of Transportation and/or the City of Chattanooga.
- P. Restore existing pavement, curbs, sidewalks, sodding, etc. removed or damaged in connection with work.
- Q. For insulated piping below grade, provide a bed of 6" sand minimum. After the insulation finish has cured, backfill with sand around the installation and over the insulation to a minimum of 6".

3.3 CUTTING AND PATCHING:

- A. Provide all cutting, patching, etc. incident to this work.
- B. Do not cut into any structural element without written approval of Engineer.
- C. Patching shall be: (1) of quality equal to, and of appearance matching existing construction, and (2) shall restore all services and construction which remains in use to its condition prior to this contract, unless otherwise noted.

3.4 PIPING THRU RATED WALLS AND FLOORS:

- A. Insulation on pipe passing thru fire rated walls must stop at pipe sleeve. Space between metal pipe and sleeve shall be protected with 3M Fire Barrier Penetration Sealing System or approved substitute. Installation shall be in accordance with the manufacturers recommendations for the hourly fire rating of the partition. The system shall be U.L. listed. Maintain vapor barrier on insulated chilled water and refrigerant suction piping.
- B. PVC pipe passing through rated walls or floors shall have 3M UL modified fire protection system.
- C. Refer to details on drawing for pipe and duct penetration thru rated walls and floors.

3.5 FLASHING:

- A. Where pipes, ducts, etc. pass through roof, flash per drawing details. Where no detail is shown, use National Roofing Contractors Association Details.

- B. Locate pipes, ducts, etc. through roof to clear parapets, etc. by at least 18".
- C. Provide flashing or caulking as required at each opening through outside walls or roof. Flashing through roof of same materials and methods as under "Moisture Protection Division"; through walls shall be aluminum unless noted otherwise.
- D. Make roof drains and floor drains in upper floors, watertight with 4 lbs. per square foot sheet lead or polypropylene sheeting extending at least 12" from drain rim into membrane waterproofing and clamped to drain.
- E. Flashing shall provide watertight seal with 8" depth of water on roof.
- F. Where ducts pass through concrete floors, provide a 3" x 3" concrete curb with sheet metal cap flashing, when through roofs, provide a 3" x 12" high-insulated curb or pre-fabricated insulated roof curb.
- G. Where pipes pass through floor structures, other than slabs on grade, which floors contain a waterproofing membrane, provide a watertight floor sleeve for each pipe.
- H. Provide necessary curbs to receive flashing. See SMACNA Plate #65 and/or drawing details.
- I. Sheet lead shall be FS #QQ-L-201A.

3.6 PROTECTION:

- A. Work shall be protected at all times. Pipes openings shall be closed with caps or plugs until permanent connections are made. Fixtures and equipment shall be covered if necessary, to protect against dirt, water, chemical or mechanical damage or defacement.

3.7 TEMPORARY WORK:

- A. Provide 3/4" water service with hose faucet 18" above grade located per instructions. Provide freeze protection. Upon completion of project: (1) close branch cock, (2) cap at point 18" below grade, (3) mark with concrete post.
- B. Water and electricity consumed during construction shall be paid for by General Contractor.

END OF SECTION

SECTION 23 05 29

HANGER & SUPPORTS FOR HVAC PIPING & EQUIPMENT

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.
- B. Support (1) from wood using coach screws on open construction and hanger flanges on sheeting, (2) from concrete using inserts, (3) from steel using beam clamps, rivets or bolts, (4) from concrete blocks using toggle or through bolts. Fasten supports to building in following order of preference: (1) steel framing, (2) concrete, (3) wood framing, (4) masonry, (5) wood sheathing. Do not support from roof deck without approval. All hangers, rods, and inserts shall be Underwriters Laboratories approved for the service intended and shall meet MSS #SP-58-2009 & 69-2009, and 2008 SMACNA guidelines for Seismic restraints of mechanical systems.
- C. Adhesives are not acceptable as mounting or supporting devices.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Mechanical General Provisions, See Section 23 01 01.
- B. Basic Materials and Methods, Section 23 01 05.
- C. Vibration & Seismic Controls for HVAC Piping & Equipment, Section 23 05 48.

PART 2 - PRODUCTS:

2.1 HANGERS:

- A. Use adjustable swivel ring band type for pipe 2-1/2" and smaller, except C.I. For pipe 3" and larger and for cast iron pipe, unless otherwise noted, use adjustable steel, clevis type.
- B. At each hanger on insulated pipe provide: (1) pipe covering protection saddles on hot lines and (2) insulation shields on cold lines.
- C. Shields/saddles to be 16 gauge, minimum 120° saddles arc with the following minimum saddle lengths:

| <u>PIPE SIZE</u> | <u>MINIMUM SADDLE LENGTH</u> |
|------------------|------------------------------|
| 1 | 12" |
| 2 | 12" |
| 3 | 12" |
| 4 | 12" |
| 6 | 18" |
| 8 & Greater | 20" |

- D. Hanger surface material shall be such that there will be no possibility of electrolytic corrosion between hanger and pipe.

- E. Anchors requiring explosive charges **shall not be used**. Phillips "Red-head" shields can be used for loads under 300 lbs.

2.2 **BASES:**

- A. On motor-driven equipment, where motor is not directly mounted on driven equipment, provide a structural steel base, reinforced to prevent flexure, which shall support both the equipment and the motor.
- B. Provide bolts, inserts, pipe stands, brackets and accessories to distribute loads over building structure.

2.3 **SLIDE BEARINGS:**

- A. Slide bearings shall consist of 2 elements each made of 3/32" thick, 100% virgin tetrafluorethylene polymer and reinforcing aggregates pre-bonded to a steel backing. Principal aggregates material shall be ground glass fibers. Bonding material shall be heat-cured, high temperature epoxy capable of -320° F. to + 500° F temperatures. The coefficient of static friction of material to itself shall not exceed 0.902".

PART 3 - **EXECUTION:**

3.1 **HORIZONTAL PIPING SUPPORT SCHEDULE:**

| <u>PIPE SIZE</u> | <u>ROD DIA.</u> | <u>STEEL PIPING MAX. SPACE</u> | <u>COPPER PIPING MAX. SPACE</u> | <u>PVC PIPING MAX. SPACE</u> |
|------------------|-----------------|--|---|--|
| Up to 1/2" | 1/4" | 6' | 4' | 3-1/2' |
| 3/4" to 1" | 3/8" | 7' | 5' | 4' |
| 1-1/4" | 3/8" | 7' | 7' | 5' |
| 1-1/2" | 3/8" | 8' | 8' | 5' |
| 2" | 3/8" | 10' | 8' | 5' |
| 2-1/2" | 1/2" | 11' | 9' | 6' |
| 3" | 1/2" | 12' | 10' | 6' |
| 4" | 5/8" | 14' | 11' | 6-1/2' |
| 6" | 3/4" | 17' | -- | 7-1/2' |
| 8" | 7/8" | 19' | -- | 8' |
| 10" | 7/8" | 20' | -- | 8-1/2' |
| 12" | 1" | 22' | -- | 9-1/2' |
| 16" | 1-1/8" | 26' | -- | -- |
| 18" | 1-1/4" | 28' | -- | -- |
| 20" | 1-1/4" | 30' | -- | -- |
| 24" | 1-1/2" | 32' | -- | -- |

3.2 METHOD:

- A. Provide hanger within 18" of each elbow, also provide hanger within 18" of connection to each piece of equipment.
- B. When supporting PVC pipe, provide 18 ga. 12" long shield at each hanger.
- C. Pipes passing thru walls shall not bear on building construction.
- D. Hangers shall be sized to fit outside diameter of insulation and shield/saddle. Provide shields at each hanger. On 2½" and larger pipe, provide an "insert" 18" longer than the shield/saddle specified above; use Foamglass or calcium silicate or polyurethane foam with a jacket (same as insulation) on the "run" of the pipe. Hanger shall not bear on insulation.
- E. All floor-mounted equipment shall be mounted on a reinforced concrete base covering the complete floor area of equipment. This concrete base shall be 4" high and shall extend 6" beyond the equipment on all sides. The concrete base shall be doweled into the building concrete slab. Provide all necessary anchor bolts and templates. Provide 1/4" thick layer of non-shrinking grout between floor-mounted machinery and concrete pad. Where equipment mounts on structural steel, provide shims. Chamfer each edge a minimum of 3/4" x 3/4".
- F. Any piece of equipment installed in a finished ceiling, or wall area, shall be supported independently of the building finish. Ceiling-mounted items shall be supported directly from the building structure.
- G. Suspended equipment shall be supported from building structure by adjustable rods.

END OF SECTION

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. The work required under this section includes all work necessary for the installation of seismic restraint on mechanical and electrical equipment.
- B. The work of this section is subject to the requirements of the Mechanical General Provision and Basic Materials Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Mechanical General Provisions, Section 23 01 01.
- B. Basic Material and Methods, Section 23 01 05.

1.3 EQUIPMENT VIBRATION ISOLATION:

1. For all rotating or reciprocating equipment, except where specifically noted, provide isolation systems, noted herein and/or as scheduled on the drawings, having a minimum efficiency of 90% in preventing transmission of vibration into structure. Design for frequencies to be absorbed.
2. Mounting shall be color-coded for identification of load capacity.
3. Mountings used out-of-doors shall have metal either hot-dip galvanized or fabricated from stainless steel.
4. Isolators shall be as manufactured by Kinetic & Noise Control, Mason Industries, Vibration Eliminator Company or Vibration Mountings and Controls, Inc.
5. For all rotating or reciprocating equipment, except where specifically noted, provide isolation systems, noted herein and/or as scheduled on the drawings, having a minimum efficiency of 90% in preventing transmission of vibration into structure. Design for frequencies to be absorbed.
6. Mounting shall be color-coded for identification of load capacity.
7. Mountings used out-of-doors shall have metal either hot-dip galvanized or fabricated from stainless steel.
8. Isolators shall be as manufactured by Kinetic & Noise Control, Mason Industries, Vibration Eliminator Company or Vibration Mountings and Controls, Inc.

1.4 SEISMIC RESTRAINT DESIGN CRITERIA

A. General:

1. This project is located in Seismic Zone 2. **OPTION:** [but will require a Seismic Zone 4 Design in accordance with the 1991 Uniform Building Code (UBC) for an Emergency Facility with Life Safety considerations.]

2. Design Seismic Restraints for both Horizontal and Vertical forces specified herein acting simultaneously at the equipments center-of-gravity. Seismic Forces shall be resisted by positive anchorage and not by friction.
3. Seismic Calculations are to be submitted for all restraint connections to the structure to verify that the restraining devices selected equal or exceed allowable ratings and to advise the projects engineer of the additional Seismic loads applied to the buildings' structure. Seismic calculations are to be signed and sealed by a registered engineer in the state of Tennessee.
4. The Equipment Manufacturer shall provide the following:
 - a. Mounting hole locations and specific anchor details.
 - b. The equipment Vertical and Horizontal center-of-gravity.
5. The registered engineer who performed the seismic calculations shall visit the project upon completion of the seismic restraint installation and submit a letter indicating that the restraints have been installed properly and the proper restraints have been installed to meet the applicable seismic zone requirements.

B. Rigid Seismic Restraint Loads:

1. Horizontal - All rigid floor mounted equipment shall be designed to safely withstand a seismic acceleration equal to $F_p = 0.45 G$.
2. Vertical - A Vertical Seismic force equal to 0.33 times the above horizontal seismic force shall be considered and equal to $(1/3 F_p) = 0.15 G$.

C. Resilient or Suspended Seismic Restraint Loads:

1. All isolated and suspended equipment shall be designed for twice the horizontal and vertical seismic forces specified for rigid seismic restraints. The accelerations are as follows: $F_p = 0.9 G$ and $(1/3 F_p) = 0.30 G$.

PART 2 - PRODUCTS:

2.1 SEISMIC RESTRAINT TYPES:

- A. Type I: Shall comply with the general characteristics of a freestanding spring isolator. Incorporating all-directional snubbing restraints and capable of supporting the equipment at a fixed elevation during installation. The structural steel housing along with the isolation manufacturers anchoring recommendations require a 1.0G acceleration capacity.

Vibration Eliminator Type: "KWSR"

- B. Type II: Aircraft Cable with seismically qualified end fastening devices to equipment and structure. Systems to be field bolted to deck or overhead structural members with manufacturers attachment recommendations.

Vibration Eliminator Type: "SCR" Seismic Cable Restraints

- C. Type III: Non-Isolated equipment shall be field bolted or welded (power shots not acceptable) to the structure as required to resist seismic forces. Calculations must specify bolt diameters, embedment depths, spacing and edge distance requirements and/or weld lengths.

2.2 VIBRATION AND ISOLATION TYPES:

Base Mounted equipment shall be provided with vibration absorbing equipment either singularly or In combination specified herein and/or schedules and drawings and shall be as follows:

- A. Type A: Double deflection neoprene in shear mountings; minimum static deflection of 0.35". All metal surfaces neoprene covered; provide friction pads top and bottom. Where noted, provide steel rails to compensate for the overhang. Mounts used with equipment requiring bolt down to the supporting structure shall incorporate a drilled steel anchor/base plate.
- B. Type B: Spring type isolators; free standing and laterally stable without any housing, complete with 1/4" neoprene acoustical friction pads between base plate and support, and with leveling bolts for rigid bolting to equipment. Spring diameters; no less than 0.8 of compressed height of the spring at rated loads. Spring shall have minimum additional travel to solid equal to 50% of rated deflection.
- C. Type C: Spring mountings as described for "Type B" but with a housing that includes vertical resilient limit stops to prevent spring extension when weight is removed. A minimum clearance of 1/2" shall be maintained around restraining bolts and between the housing and the spring. Limit stops shall be out of contact during normal operations.

2.3 Equipment vibration bases where shown or required shall be the following:

- A. Type 1: Integral structural steel bases shall have all perimeter members as beams with a minimum depth equal to 1/10th of the longest dimension of the base. Provide height-saving brackets in all mounting locations for a base clearance of 1".
- B. Type 2: Provide structural concrete forms for floating foundations. Bases shall have a minimum depth of 1/12th of the longest dimension of the base, but not less than 6". Minimum concrete reinforcement half-inch bars or angles welded on 6" centers both ways in a layer 1-1/2" above the bottom. Using height saving brackets in all mounting locations. Maintain 1" clearance below the base.

2.4 Suspended mounting equipment and piping shall be provided with vibration absorbing equipment as follows:

- A. Type D: Vibration hangers shall contain a steel spring and 0.3" deflection neoprene element in series. Neoprene element shall be molded with rod isolation bushing passing through hanger box. Spring diameters and hanger box lower hole size shall be large enough to permit hanger rod to swing through a 30° arc before contacting hole. Springs shall have minimum additional travel to solid equal to 50% of rated deflection.
- B. Type E: Vibration hangers shall contain a steel spring in a neoprene cup with a grommet to prevent short-circuiting of hanger rod. Cup shall contain a steel washer to distribute load on neoprene and prevent extrusion. Spring diameters and hanger box lower hole sizes large enough to permit the hanger rod to spring through a 30° arc before contacting the hole. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.
- C. Type F: Vibration hangers shall contain steel spring and a fiberglass isolator element in series. Fiberglass element shall be bonded to hanger bracket element and shall be molded with rod isolation bushing passing through hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit hanger rod to swing through a 30° arc before contacting hole. Springs shall have minimum additional travel to solid equal to 50% of rated deflection.

2.5 Piping flexible connectors and pump connectors for vibration isolation shall be as follows:

- A. Stainless steel corrugated bellous type with restrained connectors. Connectors shall be HYPAN Model 5501R or approved equal.

- B. Type H: 2-1/2" and smaller hoses shall have brass screw type ends attached by expansion or swedging. 3" and larger hoses shall have integral rubber duct flanges, wire reinforced carcasses and malleable backup rings. Clamps are unacceptable. Lengths shall be six times the diameter with a maximum length of 36". All hoses suitable for 240° service and shall be of butyl rubber. Install hoses on equipment side of shut-off valves in a horizontal position parallel to the equipment shaft. Protect against elongation by use of flexible control cables, two or more as required, and consisting of a plow steel cable with swedged-on end fittings passing through oversized holes in anchoring plates. End fittings isolated by neoprene and fabric washer bearing area. Cables and hoses shall be selected with a minimum safety factor of three. Rigid control rods and simple rubber washer assemblies are unacceptable.
- C. Type I: Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger; flanged, smaller sizes shall have male nipples. Lengths: 12" long through 1-1/2" diameter; 18" through 4" diameter; 24" through 8" diameter; and 36" thereafter. Install hoses on equipment side of shut-off valves horizontally and parallel to the equipment shafts.
- D. TYPE K: Flexible neoprene connectors shall be of multiple plies of nylon tire cord fabric and neoprene both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement. Connectors shall be rated a minimum of 150 psig at 220°F. Connectors installed in un-anchored piping or connecting to isolated equipment shall have control rods or cables inserted through connector and pipe flanges. Connectors shall have 150 lb. floating flange connections on each end.

PART 3 - EXECUTION:

- 3.1 All floor mounted equipment, whether isolated or non-isolated, shall be bolted or welded to the structure to safely withstand the seismic acceleration forces specified in paragraphs B and C of this specification. The isolation manufacturer and/or the seismic specialist shall specify the appropriate foundation anchoring systems.
- 3.2 All suspended equipment shall be four point independently braced with Type II cable restraints, installed taut for non-isolated equipment and slack with 1/2-inch cable deflection for isolated equipment.
- 3.3 Where base anchoring of equipment is insufficient to resist seismic forces, additional restraints such as Type II shall be located above the equipments center-of-gravity to suitably resist the applied "G" forces. Note: Base anchorage is still required.
- 3.4 SEISMIC RESTRAINTS FOR DUCTWORK:
 - A. Seismic restraints for ductwork shall be provided in accordance with Seismic Hazard Level (SHL) "A" of the 1991 SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems. All restraint locations shall consist of two seismic cables at each hanger restraint location or point of attachments. Cables shall be installed at a 45° angle to both the ducts axis and the ceiling. Cables shall be installed taut for non-isolated ductwork and slacked with 1/2-inch cable deflection for isolated ductwork. Spacing of braces is to be as follows:
 - a. Brace all rectangular duct with cross sectional areas of 6 square feet and larger. Transverse bracing at a maximum of 30 feet intervals and at each duct turn and end of runs. Longitudinal bracing at a maximum of 60-foot intervals.
 - b. Seismic Restraints are not required on the following:
 - 1) All rectangular duct less than 6 square feet in cross sectional area and all round duct less than 28 inches in diameter.
 - 2) Duct suspended by hangers 12 inches or less in length as measured from the top of the duct to the bottom of the support where the hanger is attached.

Note: Hangers must be positively attached to the duct within 2 inches of the top of the duct, with a minimum of two #10 sheet metal screws.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION OF HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.

PART 2 - PRODUCTS:

Not used.

PART 3 - EXECUTION:

3.1 IDENTIFICATION:

- A. Identify all pipe by providing colored pipe markers, identifying the piping using flow arrows and colored bands: (1) in all accessible locations at 20 ft. intervals, (2) at each valve, (3) at each branch takeoff point, and (4) where a pipe leaves or enters a wall or floor so that lines may be traced from start to finish. Pipe labels and bands shall be snap on or strap on "setmark" as manufactured by Seton Name Plate Corporation, New Haven, Connecticut 06519, or approved equivalent meeting this level of quality. Identification colors, legend, letter sizes shall conform to ANSI and/or OSHA specifications.
- B. Identify all major items of equipment, including control panels and associated starters, switches, relays, etc. by 2-1/2" x 3/4" metal nameplates. Secure with screws or brads, adhesives alone are not acceptable. Nameplates after installation shall be easily visible and shall bear notations corresponding to those shown on record drawings.
- C. Contractor shall mark the location of each duct smoke detector and all fire dampers. The mark shall consist of red marking tape acceptable to the Architect location on the ceiling grid at the location of each device.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL:

1.1 RELATED DOCUMENTS:

- A. All division 23 specification sections, drawings, and general provisions of the contract apply to work of this section, as do other documents referred to in this section.

1.2 SCOPE OF WORK:

- A. The mechanical contractor will contract with an independent testing, adjusting, and balancing (TAB) agency to test, adjust, and balance the HVAC systems.
- B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems, as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results.
- C. The items requiring testing, adjusting, and balancing include the following:

AIR SYSTEMS:

Supply Fan AHU
Return Fans
Relief Fans
Exhaust Fans
Zone Branch & Main Ducts
Diffusers, Registers & Grilles
Coils (Air Temperatures & Air Pressure Drops)

1.3 DEFINITIONS, REFERENCES, STANDARDS:

- A. All work shall be in accordance with the latest edition of the AABC National Standards, NEBB or SMACNA Standards for field measurement. If these contract documents set forth more stringent requirements than the AABC National Standards, these contract documents shall prevail.

1.4 QUALIFICATIONS:

- A. Agency Qualifications: The TAB Agency shall be a current member of the Associated Air Balance Council (AABC). National Environmental Balancing Bureau, or certified by Environmental Consultants as a Senior TAB Technician.
- B. Instrumentation, Total System Balance, Test and Balance technicians shall be full time employees of the selected balancing agency. Senior technicians shall have a minimum of five (5) years field experience and related formal training. The ratio of senior technicians to apprentice/associate technician shall not be less than one to one.

1.5 SUBMITTALS:

- A. Qualifications: The TAB agency shall submit a company resume listing personnel and project experience in air and hydronic system balancing and a copy of the agency's test and balance engineer (TBE) certificate.
- B. Procedures and Agenda: The TAB agency shall submit the TAB procedures and agenda proposed to be used.
- C. Sample Forms: The TAB agency shall submit sample forms, which shall include the minimum data required by the AABC National Standards.

1.6 TAB PREPARATION AND COORDINATION:

- A. The TAB agency shall review the project documents and contractor submittals for their affect on the TAB process and overall performance of the HVAC system within thirty (30) days after contract award to the mechanical contractor. The TAB agency shall submit recommendations for enhancements or changes to the engineer in writing.
- B. Shop drawings, submittal data, up-to-date revisions, change orders, and other data required for planning, preparation, and execution of the TAB work shall be provided to the TAB agency by the mechanical contractor no later than 30 days prior to the start of TAB work.
- C. System installation and equipment startup shall be complete prior to the TAB agency's being notified to begin.
- D. The building control system shall be complete and operational. The Building Control System contractor shall install all necessary computers and computer programs, and make these operational. Assistance shall be provided as required for reprogramming, coordination, and problem resolution.
- E. All test points, balancing devices, identification tags, etc. shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.
- F. Qualified installation or startup personnel shall be readily available for the operation and adjustment of the systems. Assistance shall be provided as required for coordination and problem resolution.

1.7 REPORTS:

- A. Final TAB Report - The TAB agency shall submit the final TAB report for review by the engineer. All outlets, devices, HVAC equipment, etc., shall be identified, along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" assuring that the project systems were tested, adjusted and balanced in accordance with the project specifications.
- B. Upon approval, submit three (3) copies of the final report to the engineer.
- C. General:

State method of measurement in report for each measurement.

Report should include pump curves, fan curves, balance valve schedule with settings and flow

charts, balance damper schedule with settings and flow charts, VAV box flow charts, AHU flow charts, all heat exchanger performance charts and actual delta P, equipment pressure drop from manufacturers data on **installed** equipment at design flow.

1.8 DEFICIENCIES:

- A. Any deficiencies in the installation or performance of a system or component observed by the TAB agency shall be brought to the attention of the appropriate mechanical contractor and the engineer.
- B. The work necessary to correct items on the deficiency listing shall be performed and verified by the mechanical contractor before the TAB agency returns to retest. Unresolved deficiencies shall be noted in the final report.
- C. All deficiencies shall be submitted to the engineer under separate cover letter entitled, "System Deficiencies."

PART 2 - INSTRUMENTATION

- 2.1 All instruments used for measurements must have been calibrated within a period of six (6) months prior to use. Calibration and maintenance of all instruments shall be in accordance with the requirements of AABC National Standards. All final test analysis reports shall include a letter of certification listing instrumentation used and last date of calibration, and who performed calibration.

PART 3 - EXECUTION:

3.1 GENERAL:

- A. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be + or - 10% except for NC levels where there is to be zero (0) tolerance unless otherwise stated.
- B. Equipment settings, including manual damper quadrant positions, manual valve indicators, and similar controls and devices shall be marked to show final settings.
- C. All information necessary to complete a proper TAB project and report shall be per AABC standards unless otherwise noted. The descriptions for work required, as listed in this section, are a guide to the minimum information needed.
- D. Test all heating, cooling and ventilating equipment. When installation is complete, all equipment shall be tested for proper operation and functioning in accordance with the contract documents.
 - 1. All equipment, motors, fans, etc., shall run at their required speed and be free from excessive vibration and noise. No bearings, journals, or any part of the motors shall heat to a temperature in excess of 40°C. above the temperature of the surrounding air.

3.2 AIR SYSTEMS:

- A. The TAB agency shall verify that all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full open position. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards:
 - 1. For supply fans:

- a. Fan speeds - Test and adjust fan RPM to achieve maximum or design CFM.
 - b. Current and Voltage - Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
 - c. Pitot-Tube Traverse - Perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total CFM.
 - d. Outside Air - Test and adjust the outside air on applicable equipment using a Pitot-tube traverse. If a traverse is not practical use the mixed-air temperature method if the inside and outside temperature difference is at least 20 degrees Fahrenheit or use the difference between Pitot- tube traverses of the supply and return air ducts.
 - e. Static Pressure - Test and record system static profile of each supply fan.
2. For exhaust, return, and relief fans:
- a. Fan speeds - Test and adjust fan RPM to achieve maximum or design CFM.
 - b. Current and Voltage – Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
 - c. Pitot-Tube Traverse – Perform a Pitot-tube traverse of the main return ducts to obtain total CFM.
 - d. Static Pressure – Test and record system static profile of each return fan.
3. For zone, branch and main ducts:
- a. Adjust ducts to within design CFM requirements. As applicable, at least one zone-balancing damper shall be completely open. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
4. For diffusers, registers and grilles:
- a. Tolerances - Test, adjust, and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts.
 - b. Identification - Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.
6. For Coils:
- a. Air Temperature – Once air flows are set to acceptable limits, take wet bulb and dry bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.
 - b. Air Pressure Drop – Test and record air pressure drop across each coil (cooling coil when wet).
 - c. Records on coil data sheets.

3.3 ADDITIONAL TAB REQUIREMENTS:

A. Job Site Inspections:

During construction, the TAB agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of two times.

(Typically, these are performed when 60% of the total system is installed and again when 90% of the total system is installed, prior to insulation of the duct and piping). The TAB agency shall submit a written report of each inspection to the engineer.

- B. Duct Leakage Testing:
The mechanical contractor shall isolate and seal sections of ductwork for testing. The test pressures shall be at the full operating pressure of the fan system unless otherwise specified in the appropriate duct classification section. The testing shall be done in sections. All testing shall be based on one test per section only unless otherwise noted.
- C. Verification of HVAC Controls:
The TAB agency shall be assisted by the building control systems contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:
1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freeze stats, and other safety devices.
 2. Verify that all controlling instruments are calibrated and set for design operating conditions.
- D. Temperature Testing:
To verify system control and operation, a series of three temperature tests shall be taken at approximately two-hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.
- E. TAB Report Verification:
At the time of final inspection, the TAB agency may be required to recheck, in the presence of the owner's representative, specific or random selections of data recorded in the certified report. Points and areas for recheck shall be selected by the owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10% of the total number tabulated in the report.
- G. The TAB agency shall test and adjust kitchen hood total air flow by duct Pilot-tube traverse if applicable under local code. All sealing of test holes in the exhaust duct to be by the mechanical contractor per local code requirements. The TAB agency shall test and record face velocities in accordance with design requirements. It shall test and adjust makeup air flow (if included) to meet design face velocities and pressurization and to minimize turbulence.
- H. Building/Zone Pressurization:
The TAB agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differential. For positive pressure areas, it shall set the supply air to design flow and gradually reduce the exhaust air rate to obtain the required flow or pressure difference. For negative pressure areas, it shall set the supply air to design flow, and gradually increase the exhaust air rate to obtain the required flow or pressure difference.
- I. Stairwell Pressurization:
The TAB agency shall test and adjust stairwell pressurization system to provide design air flow into the stairwell and set reliefs to maintain required pressurization. When required by the local authority, it shall check door pull force on all exit doors to specified requirements.
- J. Fire and Smoke Testing:

The TAB agency shall test fire/smoke dampers to assure operation. It shall verify that an access door has been installed for each fire and smoke damper. For fire dampers, the TAB agency shall open the access door, disconnect the fusible link, and allow the damper to close. Operation should be smooth and the damper must close completely. The TAB agency shall then reset the damper. For the smoke damper, the TAB agency shall open the access door, activate the damper, and observe operation. The damper must close quickly and completely. The TAB agency shall then reset the damper and observe its complete opening.

L. Life Safety Controls:

The TAB agency shall test and record life safety control operation on the HVAC equipment. It shall verify the installation of required smoke detectors in air handling equipment (AHE), and shall verify operation of the smoke detector by activating the smoke detector and observing air handler shutdown. With the controls and alarm contractors, the TAB agency shall verify the operation of interconnected systems such as the AHE smoke detector's activation of the fire alarm system and the alarm system's activation of the life safety control sequences.

3.4 EXTENDED WARRANTY:

- A. Test and Balancing Agency shall include an extended warranty of 90 days, after completion of test and balance work, during which time the Engineer at his discretion may request a recheck on resetting of any outlet, supply air fan, exhaust fan, pumps, etc. as listed in test report.
- B. The Agency shall provide technicians to assist the Engineer in making any test he may require during the period of time.

END OF SECTION

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL:

1.1 WORK INCLUDED:

- A. Work required under this section consists of insulation for duct systems as hereinafter specified.
- B. Certain systems to be factory insulated by manufacturer. Factory insulation materials to be as specified in applicable sections of the specifications.
- C. The work of this section is subject to the requirements of the Mechanical General Provision and Basic Materials Specifications.
- D. Treat insulated duct surfaces in equipment rooms and where exposed to normal view, so surfaces may be painted with paint similar to Foster (BF) "Lagtone" color paint or good quality water base latex paint. Use of mastics, adhesives or jacketing which cause "bleeding" is prohibited.
- E. Thermal resistance "R" values used herein are expressed in units of "Hour degrees F sq. ft/BTU per inch of thickness" on a flat surface at a mean temperature of 75 degrees F, unless specifically noted.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Mechanical General Provisions, Section 23 01 01.
- B. Basic Materials and Methods, Section 23 01 05.
- C. Ductwork Accessories, Section 23 33 00.

1.3 CERTIFICATION:

- A. Insulation for above grade, inside building ductwork, to be certified by manufacturer as having fire hazard classification rating, when tested in accordance with ASTM E 84, NFPA 225 and UL 723, not exceeding the following. "Insulation" to consist of insulating material, fittings, jacket, tapes, mastic, attachments and adhesive, either as a "system" or as an individual component when used separately.
 - 1. Duct insulation and other insulation located in ceiling plenums or rooms utilized for return air plenums - flame spread of less than 25, fuel contribution of less than 50 and smoke development of less than 50.
- B. Duct, above grade exposed to weather outside building, insulation to be certified as being self-extinguishing for 1" thickness in less than 53 seconds when tested in accordance with ASTM D1692.
- C. Certify that all duct insulation meets the minimum requirements of the current issue of the "Local and/or State Code for Energy Conservation in New Building Construction.

PART 2 - PRODUCTS:

2.1 FIBERGLASS BLANKET FOR DUCTS:

- A. Provide minimum 1 pound per cubic foot density, meeting MIL-Spec and MIL-I-22023A, flexible, factory-reinforced foil-faced FSK jacket Kraft vapor barrier glass fiber blanket "system" type insulation, having a minimum "R" value installed of 5.0. Insulation to conform strictly to fire-resistive qualities hereinbefore specified in "Certification" paragraph. Provide insulation for the following:
1. Unlined conditioned supply ducts - 2" thick.
 2. Sterilizer or autoclave exhaust branch ducts - 2" thick.
 3. Outside Air Ducts - 2" thick
 4. Unlined return air ducts in attic space not heated or cooled 2" thick.
 5. Top of supply air diffusers, air balancing boxes and all other components of duct system - 2" thick.

2.2 FIBERGLASS BOARD TYPE FOR DUCTS:

- A. Provide minimum 6 pound per cubic foot density semi-rigid, factory-reinforced foil faced Kraft vapor barrier glass fiberboard "system" type insulation with FSK jacket, having a minimum "R" value of 4.34. Insulation to conform strictly to fire-resistive qualities hereinbefore specified in "Certification" paragraph. Provide insulation for following:
1. Ducts outside exposed to weather - 2" thick, provide with PVC jacketing sealed weather tight.

PART 3 – EXECUTION:

3.1 GENERAL:

- A. Duct systems shall have been tested and found free of all leaks prior to installation of insulation covering. Verify with engineer.
- B. All surfaces to be cleaned of grease, dirt, dust, scale and dry when covering is applied.
- C. Install all insulation products in strict accordance with manufacturer's instructions using professional insulators who have adequate experience and ability.
- D. Exposed to view insulation shall have a well-tailored appearance.
- E. See General Provisions for sleeves and insulation requirements.
- F. Stop all duct coverings, including jacket and insulation, at fire dampered penetrations of walls, floors above grade and roofs. Pack opening between pipe and sleeve with fire resistant material. "Fan-out" or extend jacketed insulation at least 2" beyond angle frames of fire dampers and secure to structure. Maintain vapor barrier. Install covering over damper access panel so as to be readily removable and indentifiable.
- G. Cover all joints, rips, tears, punctures, disc heads, staples or breaks in vapor barrier jacket with 4" wide woven glass fabric tape embedded in gray or white vapor barrier fire resistant coating.
- H. Duct dimensions shown on drawings are "NET". Increase as required to give final clear air passage per dimensions.

END OF SECTION

SECTION 23 09 22

AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL:

- 1.1 Provide a complete electric and electronic system of automatic temperature controls as specified herein and as indicated on the drawings. This school is provided with a DDC control system by E.C.I. of Chattanooga. Controls for this building shall be by ECI, no substitutions.

PART 2 - SCOPE:

- 2.1 The control system shall consist of all thermostats, temperature sensors, controllers, automatic valves and dampers, damper operators, and a complete system of wiring interlocks to fill the intent of the specification and provide for a complete and operable system.

PART 3 - SERVICE AND GUARANTEE:

- 3.1 After completion of the installation, this contractor shall completely adjust all control equipment provided under this contract; place the system in operation, and instruct the operating personnel in the operation of the control system.

PART 4 - TEMPERATURE CONTROL WIRING:

- 4.1 All electrical wiring (other than power wiring) in connection with the automatic temperature control system shall be furnished by this contractor, in accordance with the electrical specification. (See Division 26).

PART 5 - SUBMITTAL AND APPROVAL:

- 5.1 This contractor shall submit copies of complete temperature control diagrams with written "sequence of control" and factory-printed specification data sheets covering each control device.

PART 6 - CONTROL COMPONENTS:

- 6.1 Packaged Rooftop Air Conditioning, Gas Heat Unit: Each packaged rooftop unit shall have a wall mounted thermostat. See Section 23 81 52, part 2, 2.6A for thermostat information.
- 6.2 Toilet exhaust fans: Toilet exhaust fans shall be controlled by local light switches.

END OF SECTION

SECTION 23 31 13

METAL DUCTS(LOW PRESSURE)

PART 1 - GENERAL:

1.1 WORK INCLUDED:

- A. The work required under this section includes all work necessary for the complete installation of a low-pressure system.
- B. The work of these sections is subject to the requirements of the Mechanical General Provisions and Basic Materials specifications.
- C. All ductwork shall be fabricated and installed per "SMACNA" HVAC Duct Construction Standards" 2005 Edition, hereinafter called "DM".
- D. Low pressure applies to system up to 2" WG total static pressure at velocities to 2000 FPM.
- E. Medium and high pressure applies to systems above 2" WG total static pressure at velocities over 2000 FPM, including all ductwork downstream of fan discharge and through air valve or similar device reducing air pressure below 2" WG.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Basic Materials and Methods, Section 23 01 05
- B. Duct Insulation, Section 23 07 13.
- C. Fans, Section 23 34 00.
- D. Air Duct Accessories, Section 23 33 00.
- E. Air Terminal Units, Section 23 36 13 & Section 23 36 16

PART 2 - PRODUCTS:

2.1 LOW PRESSURE SHEET METAL DUCTWORK:

- A. Sheet metal work, unless noted otherwise, shall be fabricated of Armco Zincgrip-Paintgrip galvanized steel where exposed to weather or to be painted. Sheet metal for concealed ductwork shall be fabricated of hot dipped galvanized steel. ASTM 3A-527, with gauge marking on bottom outside of duct. Where ducts are bare, use Group 1, 1.25 oz. galvanized. Where painted, use Group 4 1.25 oz galvanized and phosphatized. All metal fasteners, supports, etc. shall be galvanized steel or non-corrosive metal.
- B. Ducts shall be sizes shown on the drawings, cross-braken, rigidly braced, adequately supported and securely fastened in place. Fabricate and install ducts in accordance with SMACNA Duct manual details.
- C. Duct connections 24" wide and larger to be made using the "Ductmate System" or approved substitute. The installation to be complete using angles, corners, cleats, gaskets, sealer, and

bolts. Install according to Manufacturers instructions.

- H. Seal all joints in ductwork with either Hardcast Flexgrip 550 Duct Sealant or Hardcast 1403-181BFX Rolled Sealant Tape. Duct Sealants and tapes to be compliant with South Coast Air

Quality Management District Rule #1168. Sealants to meet UL-181-BM. Rolled sealant to meet UL-181B-FX.

2.2 TRANSITIONS:

- A. Increase-in-area transition: Transformation slope not to exceed 20°.
- B. Decrease-in-area transition: Transition slope to be maximum 30°, but 20° is preferable.
- C. Angle of transformation at connections to heaters or other equipment not to exceed 30° on approaching side of equipment and 45° on leaving side. Angle of approach may be increased to meet space conditions when transformation section is provided with vanes.

2.3 ELBOWS:

- A. Unvaned elbows may be used if throat radius equal to width of duct and full heel radius less than 36" in width.
- B. Unvaned elbows may be used if throat radius equal to 3/4 width of duct and full heel radius, over 36" in width.
- C. Square heel - 3" square throat elbow with large class single thickness vanes thru 36" unsupported vane length and large double thickness vanes for unsupported vane length of 37" thru 72". As per SMACNA Manual Figures 4-3 and 4-4.

2.4 BRANCH CONNECTIONS:

- A. Main Supply Branch: See SMACNA manual Figure 4-1, 4-5, and 4-6 - use unvaned radius transition elbow with splitter damper when branch width is 36" or smaller, and vaned square throat transition elbow when branch width is larger than 36".
- B. Sub-Branch Supply – See SMACNA manual Figure 7-6, - use straight tap with extractor, having manual control rod extended thru main branch side, when extractor weight is 50 lbs, use 45° or radius entry clinch lock collar – See SMACNA Figure 4-6, and manual balancing dampers when specifically noted on plans.
- C. Sub-Branch Return – See SMACNA manual Figure 4-6, use 45° or radius entry clinch lock collar.
- D. Round Supply Take-Offs – Use factory fabricated beaded straight spin-in type galvanized steel fillings with integral manual balancing damper. Use bellmouth type fittings where space permits.
- E. Round Return/Exhaust Tap-ins – Use factory fabricated beaded straight spin-in type galvanized steel tap fittings.
- F. For low pressure return and/or exhaust application of duct connectors to square ceiling mounted grilles or registers, use factory fabricated square-to-round galvanized steel minimum 3" deep adapter boxes having 2" long beaded round collar.

2.5 SPLITTERS:

- A. Splitter dampers for adjustment of distribution to respective branches to be installed where indicated on drawings. Splitters to be as shown in Figure 4-5, of SMACNA manual.

2.6 MANUAL DAMPERS:

- A. Hand operated butterfly type dampers to be galvanized steel, 18 U.S. gauge or heavier.
- B. Dampers for ducts to 12" depth and 12" diameter to be one blade carried on a 3/8" round steel rod mounted inside of duct without frame and fitted with locking type quadrant and brass end bearing plate accurately drilled and secured to duct. Refer to Figures A, B, and C, Figure 7-4, of the SMACNA manual for construction details.
- C. Dampers for ducts of greater depth to be multi-blade type, 12" maximum blade width up to 30" blade length and 10" maximum blade width over 30" blade width. Blades to be mounted on frame with brass sleeve bearings, interconnected for operation from one locking type hand quadrant.
- D. Round pivot rods to have section faced flat to receive locking setscrew in locking quadrant. Notching of blades to fit linkage permitted. Refer to Figure A and B Figure 7-5, of SMACNA manual.

2.7 VANES AND DEFLECTORS:

- A. Vanes and deflectors, to be galvanized steel sheet same thickness as used in ductwork of corresponding size. Vanes to be securely anchored to duct or casing and have freestanding edges braced as necessary for making rigid.

2.8 ACCESS DOORS:

- A. Access doors to be provided for access to all heaters, fire dampers, automatic dampers, smoke dampers, and other equipment installed in ducts and at other points indicated on drawings. Access doors in masonry walls to be furnished and installed under another heading.
- B. Access door to be double-panel construction, galvanized metal with rigid insulation between panels. The rigid insulation is to have an R-value that matches the R-value of the duct insulation. Doors to mount in rigid frame formed galvanized metal. Angle iron bracing to be used as required to provide rigid assembly.
- C. Access doors in ductwork, refer to Door A, B, Figure 7-2, 7-2M, and 7-3 of SMACNA manual. Casing access doors, refer to Figure 9-15 and 9-16 of SMACNA manual.
- D. Doors to close against felt gasket seal.

2.9 FLEXIBLE DUCT CONNECTION TO UNITS:

- A. Duct connections to fan units and air handling units to be made with UL approved flame resistant, self-extinguishing, water and airtight heavy glass fiber woven material impregnated with synthetic elastomer. Duro-Dyne "Durolon" Ventfabrics "Ventlon" or approved equal. See Figure 7-8, of SMACNA manual for construction details.

2.11 FABRIC DUCT:

- A. Fabric ductwork shall be constructed of a woven fire retardant fabric complying with the following physical characteristics:
 - a. Fabric Construction: 100% Flame Retardant Polyester
 - b. Weight: 7.0 oz
 - c. Color: As selected by architect
 - d. Air Permeability: 2 cfm/sf. Tested per ASTM D737
 - e. Temperature Range: 0° F to 250° F
 - f. Fire Retardancy: Meets testing requirements of fabric air dispersion systems as defined in NFPA 90A & 90B. Our product achieves a Class 1 rating per ASTM E-84.

- B. Design & Fabrication Requirements:
 - a. Lengths to include required zippers as specified by manufacturer.
 - b. Inlet transition and end cap to include zippers for easy removal/maintenance.
 - c. Dispersion by Linear Slots
 - d. Width of and location of linear slots to be specified and approved by manufacturer per the drawing requirements.
 - e. Fabric System to include connectors to attach to suspension system listed below.
 - f. Inlet connection to metal duct via metal band supplied by manufacturer.
 - g. Fabric ductwork shall be designed for 0.5-inch water gage, producing a maximum operating pressure of 3.1 inches of water.
 - h. Duct lengths, static pressure and design CFM shall be signed/approved by the manufacturer.
 - i. All deviations from a straight run shall be designed by the manufacturer to meet job specifications.

- C. Suspension Hardware:
 - a. One & Two Row Cable: Systems shall include plastic coated cable, eyebolts, cable clamps, thimbles, and turnbuckles. Attachment shall be made using snap clips spaced 24 inches apart. Vertical support hardware for longer and larger diameter applications is required. These supports should be installed approximately every 25 feet.

PART 3 - EXECUTION:

3.1 HANGING:

- A. Ducts to be supported from building structure with galvanized steel hangers per Figure 5-1 and Tables 5-1 and 5-2, of the SMACNA manual. Hangers to be secured to masonry portion of building by means of inserts or other acceptable anchors, similar to Figures 5-2, 5-3 and 5-4 of the SMACNA manual. All straps or band hangers extending down both sides of duct and under bottom, fasten to side and bottom with sheet metal screws. In general, vertical risers and other duct runs where method of support specified above is not applicable to be supported by angle brackets as shown on Figures 5-8 and 5-9 of the SMACNA manual. Seal-off such openings between ducts and floor with No. 12 gauge iron.

3.2 OBSTRUCTIONS AND RESTRICTIONS:

- A. Obstructions may not be located within ducts without specific permission of engineer for each instance. When obstructions cannot be avoided, obstructions shall be eased in accordance with Figure 4-8, of the SMACNA manual.

3.3 INSULATION:

- A. Where drawings and insulating specifications indicate that ducts are to be insulated make provision for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors, and similar operating devices.

3.4 FLEXIBLE DUCT CONNECTORS:

- A. Install in ducts crossing building expansion joints.
- B. Minimum length of 3" flame retardant fabric each side of joint per SMACNA Fig. 7-8, sew corners.
- C. Provide at intake and supply connections of all fan units and air-handling units, except those handling grease-laden air.

3.5 FLEXIBLE DUCT:

- A. Ducts must be installed without kinks or sags and supported with ¾" wide metal bands. The minimum inside radius of any bend should be one-half the diameter of the duct.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL:

1.1 WORK INCLUDED:

- A. The work required under this section includes all work necessary for the complete installation of ductwork accessories and specialties.
- B. The work of this section is subject to the requirements of the Mechanical General Provisions and Basic Materials specifications.
- C. All ductwork shall be fabricated and installed per latest "SMACNA" edition of "HVAC" Construction Standards.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Basic Materials and Methods, Section 23 01 05.
- B. Duct Insulation, Section 23 07 13.
- C. Fans, Section 23 34 00.
- D. Low Pressure Ductwork, Section 23 31 13.

PART 2 - PRODUCTS:

2.1 DUCT ACCESSORIES:

- A. Louvers - Louvers in outside walls shall be high performance weather louver. Louver to be of extruded aluminum construction with anodized finish, color by Architect. Louver shall be a minimum 4" thickness unless otherwise specified. Adjustable louvers to have vinyl blade gasket. Louvers to have 0.15" wg. pressure drop maximum at 900 fpm velocity through free area with no water carryover. All louvers to have aluminum bird screen and exterior frame. All louvers are stationary type unless noted on drawings, and shall have AMCA seal.
- B. Manual Balancing Dampers:
 - 1. Manual balancing dampers in rectangular ducts shall be opposed blade type constructed of 16 ga galvanized steel, with vinyl seals, and with a maximum leakage of 5 cfm per sq.ft at 1" wg differential pressure. All dampers to be caulked with silicone between damper duct, and have external adjustment marked Open-Closed. Quadrants for dampers in insulated ducts shall be mounted on 1-1/4" white pine blocks.
Dampers shall be furnished with controls where indicated on the drawings.
 - 2. Manual Balancing Dampers in round ducts shall be minimum two blade opposed blade type 16 ga galvanized steel with a maximum leakage of 15 cfm per square foot at 1" wg differential pressure. Quadrants for dampers shall be mounted on 1-1/4" white pine blocks.
 - 3. Manual balancing dampers in ducts with pressure over 2" wg shall have multiple opposed blade 18 gauge airfoil blades with seals. Leakage to be 15 cfm per square foot at 1" wg differential pressure. Quadrants for dampers shall be mounted on 1-1/4" white pine

blocks.

- C. Back draft and Pressure Relief Dampers shall be parallel blade type construction. Blade shall be minimum 24 ga. aluminum construction with .063" aluminum frame. Seals shall be polyurethane sponge on sill and felt on blades. 3/16" diameter steel axle rods and nylon bearings. Maximum differential pressure 1" w.g.

2.2 GRILLES, REGISTERS, AND CEILING OUTLETS:

- A. Unit rating shall be tested and certified in an ADC Certified Laboratory, or other approved laboratories, per ADC Test Codes.
- B. All flat grilles and registers shall be as scheduled on drawings, with baked enamel finish; color as selected by Architect.
- C. All outlets and inlets to have sealing gaskets and volume control dampers unless otherwise noted. On ceiling diffusers provide equalizing deflectors. Provide frame suitable for wall or ceiling installation used. Verify with Architectural drawings.

2.3 FLEXIBLE CONNECTORS:

- A. Provide flexible connectors between each air unit or fan and the duct distribution, on both the supply side and the return side.
- B. Connectors shall not exceed 10 inches in length.
- C. Connectors to be of an approved flame retardant fabric with a maximum flame spread of (25) and a maximum smoke development rating of (50).

PART 3 - EXECUTION:

3.1 INSTALLATION:

- A. Install Air Distribution Equipment and Specialties as specified above and as recommended by manufacturer.
- B. Do not install flexible ducts that have more than a 90° turn, or more than 4 feet total length.
- C. Provide all screws, bolts, nuts, inserts, etc. required for attaching accessories and items to ducts, walls, floors and ceilings.

3.2 EXCESSIVE NOISE AND VIBRATION:

- A. All air distribution equipment was selected for a noise level recommended for the space it serves. Any equipment causing excess noise or vibration will be replaced at the Contractor's expense.

END OF SECTION

SECTION 23 34 00

HVAC FANS

PART 1 - GENERAL:

1.1 WORK INCLUDED:

- A. The work required under this section includes all work necessary for the complete installation of all fans.
- B. The work of these sections is subject to the requirements of the Mechanical General Provisions and Basic Materials specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Basic Materials and Methods, Section 23 01 05.
- B. Duct Insulation, Section 23 07 13.
- C. Controls, Section 23 09 23.

1.3 CERTIFIED RATINGS:

- A. All fans shall conform to AMCA and bear the AMCA certified rating seal.
- B. Sound Power Data: Rated in accordance with AMCA 300.

PART 2 - PRODUCTS:

2.1 FANS:

- A. In-Line Fans shall be duct mounted type, direct connected or belt driven as scheduled, each complete with: square or tubular metal housing, with duct connection flanges: NEMA standard 1800 maximum rpm sealed grease lubricated ball bearing motor; centrifugal wheel; and vibration absorbing mountings for rotating parts or entire fan assembly. Each belt drive fan shall have: fan shaft mounted on grease lubricated ball bearings, either sealed type or with accessible lubricating fittings on housing exterior; Vee belt drive; adjustable pitch motor sheave ONLY for fan with single belts; belt adjusting means; and belt guard.

1. Diffuser:

- a. Diffuser shall be cast aluminum with radially projected straightening vanes with airfoil cross-sections. Leading edge of vanes, curved to reduce tone noise generation. Clips shall be applied to harmonic ring potential.
- b. V-Belt Drive: Cast iron or steel sheaves, computer selected for low noise, low maintenance operation. Center distance and arc of contact maintained within prefixed limits. Constant speed fans use variable or constant pitch drives; variable speed modulated fans use fixed drives only.

2. Fan sound power levels per octave band not to exceed the following:

Octave Band Center Frequency (Hz)

63 125 250 500 1000 2000 4000

| | | | | | | | |
|---------------|----|----|----|----|----|----|----|
| Outlet (DB) | 84 | 83 | 82 | 80 | 79 | 74 | 69 |
| Radiated (DB) | 73 | 69 | 71 | 66 | 61 | 52 | 48 |
| Inlet (DB) | 80 | 80 | 83 | 83 | 83 | 78 | 73 |

Sound power levels, especially sound radiated to the equipment room, must be attenuated to above minimum levels. Submittal must show the acoustical enclosure around fan and provide sound power data. Care must be taken by the manufacturer to reduce the lower

frequency sound power levels. The manufacturer and contractor will, at no additional cost to the owner, be responsible for a quiet system.

PART 3 - EXECUTION:

3.1 INSTALLATION:

- A. Install fans per manufacturer's recommendation.
- B. Check for proper alignment, belt tension and rotation.
- C. All exposed openings in fan housing shall be protected with screens or gratings. All fans shall have belt guards on exposed drives.
- D. Provide access doors and/or panels for servicing of belts, shafts, dampers, damper controllers, motors, etc.

END OF SECTION

SECTION 23 81 52

PACKAGED ROOFTOP AIR CONDITIONING, GAS HEAT UNITS

PART 1 - GENERAL:

1.1 WORK INCLUDED:

- A. The work required under these sections includes all work necessary for the installation of package roof top units as specified herein and/or shown or scheduled on the drawings.
- B. The work of this section is subject to the requirements of the Mechanical General Provision and Basic Materials Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Basic Material and Methods, Section 23 01 05
- B. HVAC Equipment Insulation, Section 23 07 16.
- C. Air Coils, Section 23 82 16.
- D. Air Duct and Accessories, Section 23 31 13.
- E. Controls, Section 23 09 13.

PART 2 - PRODUCTS:

2.1 PACKAGE ROOF TOP AIR CONDITIONING UNIT WITH GAS HEAT:

- A. Cabinet all-steel, welded frame, weatherproofed, all panels removable by quick opening spring loaded latches. The complete unit painted with epoxy enamel.
- B. Unit shall be low silhouette designed for rooftop installation and shipped to the job in one piece.
- C. Each unit 5 tons or larger shall be complete with all devices required for an "economizer cycle" for low ambient cooling with outside air. These shall include an outside air intake suitable for 100% outside air, and exhaust air outlet from the return air plenum, motorized return air and outside dampers, and a pressure relief fan. Relief fan to be of sufficient capacity to relieve excess pressure from the area served by the RTU in that the fan shall relieve the total supply air volume rate minus the minimum outdoor air volume rate at the static pressure loss of the return duct. Submit relief fan rate and static pressure for review. Economizer controls shall be differential enthalpy controls and shall switch unit operation from the minimum outdoor air rate setting to 100% outdoor air when outdoor air enthalpy is less than the return air enthalpy during the cooling mode. Relief fan operation to be interlocked with the economizer and shall not operate unless RTU is in economizer mode.
- D. Main supply fan shall be belt-driven forward curved, centrifugal with all metal galvanized. Motor and fan shall have permanently lubricated ball bearings. System shall be mounted on welded frame isolated from basic cabinet by rubber-in-shear isolators; no components of fan system shall come in direct contact with any portion of cabinet.

- E. Entire cabinet bottom, sides and top insulated with 1" thick, 1-1/2# density fiberglass, coated insulation.
- F. Electrical compartment shall contain non-fused disconnect motor fusing, relays, 120 volt utility receptacle, and control switches. All unit wiring shall be in accordance with the National Electric Code.

2.2 ROOF MOUNTING FRAME

- A. Frame designed to accommodate basic unit, condensing unit, heating equipment, etc. A combination weatherproofing and isolating seal factory applied to unit bottom where it contacts roof frame shall provide weatherproof joints.
- B. Roof frames shall comply with requirements of National Roofing Contractor's Association to provide cap flashing over curb by others.

2.3 HEATING SECTION

- A. Gas Furnace: Section shall consist of individual heat exchanger fabricated of corrosion resistant steel with 10-year non-prorated warranty. Burner forced draft type, stainless steel, with combustion entering tangentially to the burner assembly. Combustion air intake and flue gas discharge separated as far as possible to avoid contamination of combustion air. Flue gas discharge out front of unit and maximum possible distance from ventilation air intake louvers. Gas controls shall include: main gas control valve, flame supervision control, positive blower safety switch, main gas cock, pilot cock, and adjustable main and pilot pressure regulators (5" to 15"). Combination fan-limit control shall be mounted in burner vestibule. Burner shall be factory fire tested and adjusted for immediate field operation after connection of power and fuel. Final adjustments shall be made under field conditions by installing contractor.

2.4 COOLING SECTION

- A. Direct Expansion Coil: Provide copper tube, aluminum fin type coils complete with expansion valves, distributors, and insulated piping within the cabinet extended to the rear and connected to the air cooled condensing unit. Coils shall be single circuit and capacity will be controlled by one stage of compressor unloading. Factory test at 300 psig.
- B. Air Cooled Condensing Unit: Factory assembled to basic unit to include: all piping, electrical connections, and complete operating charge of refrigerant. Condensing unit controls include: (1) one stage of cylinder unloading for capacity control, (2) high and low pressure controls, (3) crankcase heater, (4) 5-minute time delay, (5) automatic pump down the liquid line. Compressor of accessible hermetic type with operating controls arranged to lockout refrigeration below 55 degrees outdoor temperatures. Factory test at 425 psig.

2.5 AIR FILTERS

- A. Unit shall be equipped with 2" thick throwaway filters having glass fiber media in a rigid frame.

2.6 AUTOMATIC TEMPERATURE CONTROLS

- A. Unless unit control is to be accounted for with a building automation system wherein sensor, etc., would be provided by the Controls Contractor, or provide a digital, 7 day, programmable, low voltage thermostat for each unit.

- B. Programmable thermostat or building automation system shall operate interconnected return and outdoor air dampers to provide for a morning warm-up cycle, minimum ventilation at all times and up to 100% outdoor air for natural cooling.
- C. Outside air dampers shall close when (1) supply fan is "off", or (2) night setback operation.
- D. Where a building automation system is provided, a remote status panel shall be provided and located where shown and shall indicate: (1) operating conditions of unit, (2) fan operation, and (3) when filter servicing is required. Status panel shall have an "off-manual-auto" switch and a refrigeration on-off switch for remote control of unit.
- E. Unit shall have (1) accessible switches to de-energize control circuits, and heating and cooling devices, and (2) filter service switch.

2.7 FACTORY START-UP:

- A. Manufacturer shall provide factory checkout and start-up of each unit. Upon completion of installation, and upon receipt of readiness report from Contractor, the manufacturer shall provide supervision for start-up.
- B. Upon completion of start-up, a report shall be submitted to the Architect for approval.

2.8 STANDARD ONE-YEAR WARRANTY:

- A. Units shall be warranted against any and all defects in material and workmanship for a period of one year from date of original installation. This warranty covers repairs or replacement of alleged defective parts, which shall be returned, transportation charges prepaid, to manufacturer for examination and determination as to liability. Replacements will be shipped F.O.B. factory, manufacturer shall not be liable for, consequential damage, reinstallation expense, field labor charges, or the cost of service calls to analyze problems.

2.9 EXTENDED FOUR-YEAR COMPRESSOR WARRANTY:

- A. Provide an additional four-year warranty on the compressor only. This additional four-year warranty becomes effective upon the expiration date of the standard warranty listed above and is limited to replacement of a defective compressor only. Specifically excluded are: loss of refrigerant, electric controls, relays, pressure controls, fan and motor assemblies, and connecting refrigeration tubing or electrical wiring.
- B. Any part of the compressor which becomes defective as a result of negligence, Owner's failure to provide normal maintenance, improper repair or alteration.
- C. Any field labor costs for removal of compressor, transportation to exchange agency, and installation costs.

2.10 MINIMUM EFFICIENCY RATINGS

[Chattanooga, TN Area Table. Designer to confirm location equivalent]

| Size | Minimum EER or SEER | AFUES |
|-----------------|---------------------|-------|
| < or = 5 Tons | 13 SEER | 80% |
| 11.25 > 5 Tons | 10.1 EER | 80% |
| 20 > 11.25 Tons | 9.3 EER | 80% |
| > 20 Tons | 9.0 EER | 80% |

PART 3 - EXECUTION:

- 3.1 Install per manufacturers recommendations.

END OF SECTION

SECTION 23 81 58

SPLIT SYSTEM HEAT PUMP

PART 1 - GENERAL:

1.1 WORK INCLUDED:

- A. The work required under this section includes all work necessary for the installation of a split system heat pump.
- B. The work of this section is subject to the requirements of the Mechanical General Provision and Basic Materials Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Basic Material and Methods, Section 23 01 05
- B. Refrigerant, Piping & Accessories, Section 23 23 16.
- C. Duct Insulation, Section 23 07 13.
- D. Metal Ducts, Section, Section 23 31 13.
- E. Air Duct Accessories, Section 23 33 00

PART 2 - PRODUCTS:

2.1 SPLIT SYSTEM HEAT PUMP:

- A. Provide a filter box for the return air opening which shall be equipped with two inch thick oil impregnated, fiberglass, replaceable filter unit.

2.2 BLOWER SECTION (INDOOR UNIT):

- A. Provide a belt-driven, centrifugal type blower mounted on a rigid steel frame secured to the blower housing by rubber mounts. Blower wheels shall be statically and dynamically balanced. Wheels shall be carried on rubber enclosed, self-aligning, solid bronze grooved, graphite filled bearings provided with grease cups for lubrication. Motor mount design shall permit both belt adjustment and pulley alignment.

2.3 HEATER SECTION:

- A. Provide electric coil heater in insulated enclosure with service access door.
- B. The electric coil shall be open coil type, sized to provide the capacity as scheduled on the drawings. Coils to be U.L. listed and approved for use in base units.
- C. The entire coil must have airflow over its entire area at all times when the system is in operation.
- D. The heater(s) shall be supplied with over current protection per NEC. Over-current protection is to consist of built-in and pre-wired fuses per each 48-ampere maximum circuit. Maximum fuse size of 60 amps.

- E. An automatic reset thermal cutout shall be furnished for primary protection. For secondary protection, a sufficient number of heat cutouts in the power lines shall de-energize the elements in case the automatic cutout fails.
- F. Heating boxes shall be provided with solid covers.
- G. Terminal boxes shall be provided with solid covers.

2.4 DX EVAPORATOR SECTION:

- A. Provide a DX coil mounted in a cabinet, matching the main heating coil and blower cabinets. Refrigerant lines shall be factory piped to outside of the cabinet and the thermostatic expansion valve shall be factory installed. Condensate drain pan shall be 1-1/2" deep, coated on both sides with corrosion resistant material and shall have two 3/4" drain connections. Coil cabinet shall be factory insulated with foil-covered insulation.

2.5 OUTDOOR AIR-COOLED CONDENSING UNIT:

- A. Provide air-to-air electric unit of cooling capacity noted on drawing and/or schedule.
- B. Compressor unit(s) shall be welded, fully hermetic with crankcase heater(s) and vibration isolators. Units shall be designed to operate at -20°F OAT on heating cycle without shutting off. Units shall operate to 35°F OAT on cooling cycle.
- C. Condenser fans and motors shall be direct drive fans with aluminum blades and zinc plated steel hubs. Motors with permanently lubricated ball bearings and built-in current and thermal overload protection.
- D. Condenser coils shall be air-cooled condenser coil, aluminum fin secondary surface mechanically bonded to primary surface of seamless copper tubing. Sub-cooling circuit with liquid accumulator. Factory tested at 425-psig air pressure under water. Vacuum dehydrated at 175° degrees F.

2.6 CONTROLS:

- A. 115-volt control circuit with fusing and control power transformer. Wired complete and including magnetic contactors for both compressor and fan motors, 3-leg solid state compressor overload protection, high and low pressure cutouts, oil pressure switch, non-recycling pump down, reset relay, low ambient fan cycling, etc. Dual compressor units, in addition, include: separate control circuits for each compressor, a sequencing switch for alternating compressor running time, compressor service switches for de-energizing individual control circuits, and a time delay relay for step starting of 2 compressors. Unit shall start unloaded. Controls shall lockout electric heating coil operation during cooling mode.

2.7 ACCESSORIES:

- A. Provide thermostat assembly with staged heating and cooling, manual or automatic changeover and fan control. Sub-base shall include "compressor malfunction light".
- B. Emergency heat control shall consist of emergency heat thermostat sub-base (with warning light). Control shall allow for manual bypass of compressor and outdoor thermostats if compressor becomes inoperative.
- C. Provide outdoor air thermostats (with adjustable set point) to stage electric resistance heat. Wire thermostats into the electric heater contactors.

- D. An outdoor coil defrost control system shall be incorporated into the base unit to prevent frost accumulation using heating cycle.
- E. Unit refrigerant piping shall contain: solenoid valve, adjustable thermo-expansion valve, sight glass and filter dryer.

2.8 STANDARD ONE-YEAR WARRANTY:

- A. Units shall be warranted against any and all defects in material and workmanship for a period of one year from date of original installation. This warranty covers repairs or replacement of alleged defective parts, which shall be returned, transportation charges prepaid, to manufacturer for examination and determination as to liability. Replacements will be shipped F.O.B. factory, manufacturer shall not be liable for, consequential damage, reinstallation expense, field labor charges, or the cost of service calls to analyze problems.

2.9 EXTENDED FOUR-YEAR COMPRESSOR WARRANTY

- A. Provide an additional four-year warranty on the compressor only. This additional four-year warranty becomes effective upon the expiration date of the standard warranty listed above and is limited to replacement of a defective compressor only. Specifically excluded are: loss of refrigerant, electric controls, relays, pressure controls, fan and motor assemblies, and connecting refrigeration tubing or electrical wiring.
- B. Any part of the compressor which becomes defective as a result of negligence, Owner's failure to provide normal maintenance, improper repair or alteration.
- C. Field labor costs for removal of compressor, transportation to exchange agency, and installation costs.

PART 3 - EXECUTION:

3.1 EQUIPMENT INSTALLATION:

- A. Install and adjust for operation per manufacturer's instruction.

END OF SECTION

SECTION 26 00 00

ELECTRICAL GENERAL PROVISIONS

PART I – GENERAL:

- 1.1 RELATED DOCUMENTS: The General Conditions and Supplemental General Conditions are part of this division. Contractor shall and hereby agrees that he will read carefully all paragraphs and be bound by their conditions.
- 1.2 WORK DESCRIPTION:
- A. Provide all labor, equipment, material, (tools, services), etc. required to complete installation specified herein and/or shown or scheduled on drawings.
 - B. This section supplements all sections of this Division and shall apply to all phases of work hereinafter specified, shown on the drawings or required to provide a complete installation of electrical systems.
 - C. The specifications and drawings for electrical work are complementary and are for the complete interpretation of the work.
 - D. Unless noted or modified by specific notation to the contrary, the modification and/or description of any electrical item in the documents carries with it the instruction to furnish, install and connect same. It shall be understood that the intent governs the work, regardless of whether or not this instruction is explicitly stated.
 - E. No exclusion from, or limitation in the drawings or specifications, for the electrical work shall be the reason for omitting the appurtenances or accessories necessary to complete any required system or item of equipment.
- 1.3 SPECIAL CONDITIONS, ELECTRICAL:
- A. By the act of submitting a bid, this Contractor agrees that all of the "Contract Documents" in each of the Divisions of the complete specifications have been reviewed and studied, and all requirements and coordination resulting there from are included in his proposal. The Contractor further acknowledges that he has visited the site to become familiar with existing conditions.
 - B. In Division 26, the word "Contractor" means the Electrical Contractor. The word "provide" means furnish, install and connect.

- C. Do not scale drawings having 1/4" or smaller scale. Because of small scale, it is not possible to indicate all offsets, fittings and accessories; provide such as are required for complete installation.
- D. The right is reserved to move any element as much as ten (10) feet at no increase in cost provided Contractor is notified before work in question is started (prior to rough-in.)
- E. All conductors, regardless of service, shall be installed in raceways unless specifically noted otherwise.
- F. The Contract Drawings are shown in part diagrammatic, intended to convey the scope of work, indicating the general arrangement of equipment, conduit and outlets. Follow the drawings in laying out the work and verify places for the installation of the materials and equipment. Wherever a question exists as to the exact intended location of the outlets or equipment, obtain instructions from the Engineer before proceeding with the work.
- G. The Contractor is to fill out and furnish to the utility company all required forms and load information.

1.4 RELATED WORK SPECIFIED ELSEWHERE:

- A. Foundations and pads required for equipment furnished under this division of the specifications are specified in Division 03.
- B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting, is specified in Division 09.
- C. Flashing of conduits into roofing and outside walls.
- D. Heating, ventilating, and air-conditioning equipment.
- E. Plumbing Equipment.
- F. Kitchen Equipment.
- G. Fire Protection Equipment.

1.5 CODES AND STANDARDS:

- A. The intent is that the complete installation shall comply with applicable laws and ordinances, utility company regulations, and applicable requirements of the latest editions of the following:

1. NFC - National Fire Codes (NFPA)
2. NEC - National Electrical Code
3. UL - Underwriters Laboratories
4. NESC - National Electrical Safety Code
5. NEMA - National Electrical Manufacturers Association
6. OSHA - Occupational Safety and Health Act.
7. IBC - International Building Code.

- B. Where the contract documents exceed minimum requirements, the contract documents take precedence.
- C. Comply with all requirements for permits, licenses, fees and codes. Permits, licenses, fees, inspections and arrangements required for the work under this contract shall be obtained prior to commencement of the work unless otherwise specified.
- D. Comply with the requirements of the applicable utility companies serving this work. Make all arrangements with the utility companies for proper coordination of the work. Pay all charges required by the utility.

1.6 COORDINATION OF WORK:

- A. Plan all work so that it proceeds with a minimum of interference with other trades. Inform all parties concerned, of the openings required for equipment or conduit in the building construction for electrical work and provide all special frames, sleeves, inserts, supports, anchor bolts, etc. as required. Coordinate the electrical work with the mechanical installation.
- B. Work lines and established heights shall be in strict accordance with architectural drawings and specifications insofar as these drawings and specifications extend. Verify all dimensions shown and establish all elevations and detailed dimensions not shown.
- C. Lay out and coordinate all work well enough in advance to avoid conflicts or interferences with other work in progress, so that in case of interference, the electrical layout may be altered to suit the conditions, prior to the installation of any work and without additional cost to the Owner.
- D. Lines, which must pitch, shall have right-of-way over lines whose elevations can be changed.
- E. Coordinate all outlets, fixtures, etc. with floor, wall and ceiling patterns (reflected ceiling drawings).

1.7 EXECUTION OF THE WORK:

- A. Install equipment and materials in a neat and workmanlike manner and align, level and adjust for satisfactory operation. Install equipment so that all parts are easily accessible for inspection, operation, maintenance and repair.

1.8 DATA AND SHOP DRAWINGS:

- A. Prior to installation, submit certified prints and/or descriptive brochures for major pieces of equipment, fixtures, materials, etc.
- B. Submittals shall show: manufacturer's catalog number, finishes, optional features and modifications.
- C. When work in accordance with manufacturer's recommendation is specified, a copy of recommendations will be kept in job office.

PART 2 – PRODUCTS:

2.1 REFERENCE TO DRAWINGS:

- A. Reference shall be made to drawing schedules and details for: manufacturer, model, catalog number, size, capacity, performance, installation, etc. of equipment, fixtures and materials. Equipment of manufacturer's other than those named will be acceptable provided, in the opinion of the Engineer, it is of equal substance, function, performance and appearance.

2.2 CHOICE OF MATERIALS AND EQUIPMENT:

- A. In submitting substitutions, bidders should note the following minimum considerations:
 - 1. Capacities shown are absolute minima and must be equaled.
 - 2. Physical size limitations for space allotted.
 - 3. Structural Properties
 - 4. Noise Level
 - 5. Interchangeability.
 - 6. Compatibility with other materials, assemblies and equipment.
 - 7. Similar items shall be same manufacturer and style, etc. except where specifically exempted.
- B. All material and equipment, for which a UL Standard, or NEMA Standard is established, shall be so approved and labeled or stamped.
- C. Adhesives are not acceptable as a mounting, supporting, or assembling technique.

- D. Contractor shall pay any costs added to total contract as a result of a non-approved substitution.

2.3 ELECTRICAL EQUIPMENT:

- A. NEMA Standards shall be taken as minimum requirements for electrical equipment.
- B. Equipment shall operate properly under a 10% plus or minus voltage variation.

PART 3 – EXECUTION:

3.1 EXISTING SERVICES:

- A. No services shall be interrupted without written permission of Owner. Notify owner, in writing, 72 hours in advance of requested interruption.
- B. Protect active circuits, which are to remain: relocate them as directed. If existing circuits are not indicated, request instructions.
- C. Inactive circuits or those, which are to be discontinued:
 - 1. Disconnect at panel or at appropriate junction box.
 - 2. Remove existing conductors
 - 3. Remove exposed conduits and boxes including those in removable ceiling spaces.
 - 4. Cap conduits 1" behind or below finished building surfaces.
 - 5. Remove all surface raceways, conductors, etc.

3.2 INSPECTION OF SITE:

- A. The drawings are prepared from the best information available and reflect the conditions commensurate with this information. However, the contractor shall visit the site prior to submitting a proposal and shall verify the locations, sizes, depths, characteristics, etc., of all existing utilities; and familiarize himself with working conditions, hazards, existing grades, soil conditions, obstructions, etc. If it becomes evident that existing site conditions will impair the proper operation of the utilities, or the construction process, the architect shall be notified in writing.
- B. All proposals shall take these existing conditions and any revisions required into effect, and the lack of specific site information on the drawings shall not relieve the contractor of his responsibility.

END OF SECTION

SECTION 26 01 00

MECHANICAL AND ELECTRICAL COORDINATION

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS:

- A. Refer to Section 26 00 00 – General Requirements for Electrical Work.

1.2 SUMMARY:

- A. This Section describes the coordination between the Mechanical and Electrical portions of the work.

1.3 WORK INCLUDED:

- A. Responsibility - Unless otherwise indicated, motors and controls shall be furnished, set in place and wired in accordance with the following schedule. This schedule may include equipment and systems that are not required for this project. Only the equipment and systems that are required on the drawings and/or specified elsewhere will be required by this section:

| <u>ITEM</u> | <u>FURNISHED UNDER DIVISION</u> | <u>INSTALLED UNDER DIVISION</u> | <u>WIRED AND CONNECTED UNDER DIVISION</u> |
|--|---|---|---|
| 1. Equipment Motors | 23 | 23 | 26 |
| 2. Magnetic Motor Starters: | | | |
| a. Automatically controlled, with or without HOA switches | 23 | 26 | Notes 1, 3 |
| b. Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment | 23 | 23 | Notes 1, 2 |
| c. Manually controlled | 23 | 26 | Notes 1, 3 |
| d. Manually controlled and furnished as part of factory wired equipment | 23 | 23 | Notes 1, 3 |
| e. Furnished in Motor Control Centers | 26 | 26 | Notes 1, 3 |

| <u>ITEM</u> | <u>FURNISHED UNDER DIVISION</u> | <u>INSTALLED UNDER DIVISION</u> | <u>WIRED AND CONNECTED UNDER DIVISION</u> |
|--|---|---|---|
| 3. Line voltage thermostats, time clocks etc., not connected to control panel systems. | 23 | 26 | 26 |
| 4. Electric thermostats, time clocks, remote bulb thermostats, motorized valves, float controls, etc. which are an integral part or directly attached to ducts, pipes, etc. | 23 | 23 | 23 |
| 5. Temperature control panels and time switches mounted on temperature control panels. | 23 | 23 | 23 |
| 6. Motorized valves, motorized dampers solenoid valves, EP and PE switches, etc. | 23 | 23 | 23 |
| 7. Alarm bells furnished with equipment installed by Division 23. | 23 | 23 | 23 |
| 8. Wiring to obtain power for control circuits, including circuit breaker. | 26 | 26 | 26 |
| 9. Low voltage controls, thermostats valves, dampers, etc. | 23 | 23 | 26 |
| 10. Fire protection system (sprinkler) controls. | 23 | 23 | 23 |
| 11. Fire and smoke detectors installed on mechanical units and in ductwork. | 26 | 23 | Note 2 |
| 12. All relays required for fan shutdown, motorized dampers, smoke control devices, and other items integral with HVAC equipment to provide operation and control of HVAC equipment. | 23 | 23 | 23 |
| 13. Pushbutton stations, pilot lights | 23 | 23 | 23 |
| 14. Heat Tape | 23 | 23 | 26 |
| 15. Disconnect switches, manual operating switches furnished as a part of the equipment. | 23 | 23 | Note 1 |
| 16. Disconnect switches, manual operating switches furnished separate from equipment. | 26 | 26 | 26 |

| <u>ITEM</u> | <u>FURNISHED UNDER DIVISION</u> | <u>INSTALLED UNDER DIVISION</u> | <u>WIRED AND CONNECTED UNDER DIVISION</u> |
|--|---|---|---|
| 17. Multi-speed switches | 23 | 23 | 26 |
| 18. Thermal overloads | 23 | 23 | 23 |
| 19. Control relays, transformers | 23 | 23 | 23 |
| 20. Tamper switches for fire protection (sprinkler) system. | 23 | 23 | 26 |
| 21. Flow switches for fire protection (sprinkler) system. | 23 | 23 | 26 |
| 22. Alarm bells or horns for fire protection (sprinkler) system. | 23 | 23 | 26 |
| 23. Underground fuel tank leak detection and monitoring system. | 23 | 23 | 23 |

NOTES

- (1) Power wiring as defined in Section 260513 of the specifications shall be under Division 26; control wiring as defined in Section 260513 of the specifications shall be under Division 23.
 - (2) Wiring from alarm contacts to alarm system by Division 26; wiring from auxiliary contacts to air handling system controls by Division 23. Division 26 shall provide power to smoke detector. Smoke detectors required for supply duct and return air duct for all air handling systems 2000 CFM or greater. Refer to other Division specifications and drawings for more specific requirements.
 - (3) For requirements for Magnetic Motor Starters, refer to Division 23, Section 230501 – General Requirements for Mechanical Work.
 - (4) Disconnect switches, operating switches, starters and other similar items, which are factory-mounted as a part of a complete assembly, shall comply with applicable provisions of the National Electric Code. All such disconnect switches shall be fused.
- B. Connections - Make all connections to controls, which are directly attached to ducts, piping and mechanical equipment with flexible connections.
- C. Precedence
1. In general, piping systems, which require a stated grade for proper operation, shall have precedence over systems.
 2. Precedence for pipe, conduit and duct systems shall be as follows:
 - a. Building lines
 - b. Structural members
 - c. Soil and drain piping

- d. Vent piping
- e. Condensate piping
- f. Supply ductwork
- g. Exhaust ductwork
- h. Automatic fire protection sprinkler piping
- i. Domestic hot and cold water piping
- j. Electrical conduit

3. Lighting fixtures shall have precedence over air grilles and diffusers.

D. Final Inspection And Report

At the completion of the work, there shall be a meeting of the mechanical, electrical and temperature control contractors, representatives of mechanical and electrical equipment manufacturers whose equipment was actually installed on the project, and similarly-involved individuals, who shall thoroughly inspect all systems, and who shall mutually agree that all equipment has been properly wired and installed, and that all temperature and safety controls are properly functioning. A written report of this meeting, listing those in attendance, and the companies, which they represent, shall be filed with the Owner and Architect/Engineer.

END OF SECTION

SECTION 26 01 20

GUARANTEE AND WARRANTY

PART 1 – GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, material, etc. required to complete installation specified herein and/or shown or scheduled on drawings.

PART 2 – PRODUCTS:

2.1 TEST PERIOD:

- A. Each piece of equipment shall meet performance specifications after one (1) year actual operation.

PART 3 – EXECUTION:

- 3.1 The Contractor shall replace or make good any defect due to faulty workmanship or material, which shall develop within one year from date of acceptance. This guaranty shall cover both materials and labor. The Contractor is responsible to replace work found not in conformance with the contract at any time during the life of the installation. Replacement of non-conforming work is not subject to the one (1) year warranty limitations.
- 3.2 For first year after final acceptance, Contractor shall provide, at no cost to Owner, any required maintenance and service necessary to assure the proper operation of the system.
- 3.3 Date of acceptance shall be that date on which the contract has been satisfactorily completed in accord with contract documents and verified by the Engineer. If a whole or partial system, or equipment, is put into use for benefit of any party, other than Contractor, and with prior written permission of Owner, this agreed date shall become the "date of acceptance".
- 3.4 CERTIFICATION: Prior to completion and final acceptance of the installation, furnish to the Engineer certification that the electrical systems have been tested and that the installation and performance of those systems conform to the requirements of the contract documents.

END OF SECTION

SECTION 26 05 00

BASIC MATERIALS & METHODS

PART 1 - GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, material, etc. required to complete installation specified herein and/or shown on scheduled on the drawings.

PART 2 – PRODUCTS:

2.1 CONCRETE:

- A. Where required for conduit encasement, equipment, bases, manhole construction, etc., provide 3,000 psi concrete as specified in Division 3.

PART 3 – EXECUTION:

3.1 TEMPORARY LIGHT AND POWER:

- A. As soon as practicable, install temporary wiring and lighting. See NEC Article 305.
- B. Provide:
 - 1. One pigtail lamp holder with wire guard for each 600 sq. ft. of floor space or fraction thereof equipped with a 100-watt lamp and with replacement made immediately upon burnout or theft.
 - 2. A 30-amp, single-phase, disconnect switch for each 4,000 sq. ft. of floor area.
 - 3. If a floor is less than 4,000 sq. ft., one 30-amp switch per floor.
- C. Temporary wire shall consist of plastic, non-metallic sheathed cable having ground wire to which all the receptacle ground poles shall be connected.
- D. Power consumed shall be paid for by General Contractor.

3.2 EXCAVATION, SHORING, AND BACKFILL:

- A. Provide any excavation required for this Division that is necessary for general construction. Unless specifically noted, no extras shall be paid if rock or excavation difficulties are encountered.
- B. Provide separate a trench for each utility, see drawing detail.

- C. Provide:
 - 1. Bracing, shoring, etc. to protect sides of excavation,
 - 2. Staging and suitable ladders.
- D. Remove all timber before backfilling. Backfill simultaneously on both sides of equipment, raceways, etc.
- E. Compact backfill under slab, building structure, and paving to a dry density equal to that required by general contract.
- F. Restore existing pavement, curbs, sidewalks, sodding, etc. removed or damaged in connection with work.
- G. Sides and floor of excavated trench may be used as formwork for the concrete encasement provided that the excavation is clean, neat, free of debris and is of the proper size.

3.3 CUTTING AND PATCHING:

- A. Provide all cutting, patching, etc. incident to this work.
- B. Do not cut into any major structural element without approval of Engineer.
- C. Patching shall be of quality equal to, and of appearance matching, existing construction.

3.4 FLASHING:

- A. Where raceways, etc. pass through walls or roof, flash per drawing detail. Where no detail is shown, use National Roofing Contractors Association details.
- B. Locate raceways, etc. through roof to clear parapets, etc. by at least 18".
- C. Flashing shall provide watertight seal with 8" depth of water on roof.
- D. Where conduits pass through floor structures, other than lowest floor, which floors contain a waterproofing membrane, provide a watertight floor sleeve for each pipe.
- E. Where conduit or buss way pass through concrete floors, provide a 3" x 8" concrete curb with sheet metal cap flashing, fill space between conduits, etc. and sleeve with rope packing and non-flammable sealant.

3.5 MOISTURE-DAMP PROTECTION:

- A. Whenever any electrical component such as: panel, raceways, etc. will be in contact with surfaces which may become damp or wet, mount using spacers to hold electrical work 1/4" away from damp surfaces.

3.6 SLEEVES-FIRE PROTECTION:

- A. Where conduits, buss ways, etc. pass through floors or walls of fireproof construction, fill space between conduit, etc. and sleeves with 3M fire stopping or approved equal. The sealing process shall maintain the rating of the floor or wall that is penetrated.

3.7 FIRE STOPPING REQUIREMENTS:

- A. Penetrations through rated walls and floors shall be sealed with a material capable of preventing the passage of flames and hot gasses when subjected to the requirements of the Test Standard specific for Fire Stops ASTM-E-814.

3.8 FIRE RATED WALL DEVICE SEPARATION:

- A. Electrical devices and junction boxes on opposite sides of a wall must be separated by a horizontal distance of 24" in any vertical distance floor to ceiling.

END OF SECTION

SECTION 26 05 13

CONDUCTORS AND CONNECTORS

PART 1 – GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation, as specified herein and/or shown or scheduled on drawings.
- B. All conductor sizes are based on copper ampacities.

PART 2 – PRODUCTS:

2.1 MATERIALS:

- A. Conductors - Shall be 98% copper unless noted otherwise. Conductor sizes No. 10-12 AWG shall be solid wire, sizes No. 8 AWG and larger shall be stranded.
- B. Conductors, 110-600 volts
 - 1. In raceway - Type THHN/THWN, or other types when noted.
 - 2. Direct burial outside building - Type UF and USE for service entrance.
 - 3. Flexible cords - Type SO.
- C. Lighting fixtures wiring shall be
 - 1. Fluorescent, #18 AWG
 - 2. Incandescent #16 AWG.
 - 3. Larger per NEC 402 or as noted.
 - 4. Conductors shall be stranded.
- D. Conductors for isolated power shall be Type XHHW with a dielectric constant of 3.5 or less. Color code as follows:
 - #1 - Orange
 - #2 - Brown
 - Grounding Conductor - Green with Yellow Stripe.
- E. Where required to "fish" in steel partitions, block walls which are dry and similar locations, metal-clad cable, Type MC having Type THW conductors can be used where the wire size is No. 8 or smaller. Note particularly NEC Art. 330 requirements.

- F. All conductors are to be identified, branch circuits and feeders by color coding as follows:

| <u>277/480V</u> | <u>120/208V</u> |
|-------------------------------|-----------------------|
| PHASE A BROWN | BLACK |
| PHASE B PURPLE | RED |
| PHASE C YELLOW | BLUE |
| NEUTRAL WHITE W/YELLOW STRIPE | WHITE |
| GROUND GREEN | GREEN W/YELLOW STRIPE |

Contractor shall verify with local authority any wire color requirements. Local requirements shall dictate over colors specified. If no local requirements exist, these colors shall be used.

The color-coding on #8 and smaller conductors shall be continuous in length. No taping, painting or other means of coding will be acceptable. The color-coding on #6 and larger conductors shall be in the form of colored tape visible at each point of access or view.

- G. For #10 and smaller branch circuit and fixture conductor splices, use "live spring", pressure cable connectors listed for 600 volt (1000 volt when enclosed in fixture or sign).
- H. For terminal connections on copper, No. 8 or larger, or where multiple connections are made to one terminal, use solderless lugs, mechanical type as necessary.

PART 3 – EXECUTION:

3.1 CONDUCTOR SIZE:

- A. Branch Circuit conductors shall be at least No. 12 AWG except
 1. On home runs over 70' in developed length, minimum wire size shall be No. 10 AWG or larger as noted.
 2. Control circuits carrying 8 amps or less, may be #14 AWG.

3.2 INSTALLATION:

- A. All control and circuit wiring in cabinets, boxes, gutters, etc. shall be neatly tied and held using nylon cable ties and mounting brackets.
- B. Where "high-press" terminals are used, provide increased cabinet gutter space as required.

- C. Conductors 600 volt and below shall not be bent to a radius less than 10 times the diameter of the cable.
- D. After installation, conductors shall not have dents, scars, cuts, pressure indentations, abraded areas, etc.
- E. F. Talc is the only permitted wire-pulling lubricant to be used with isolated branch circuit conductors.
- F. Branch circuits from isolated power systems shall be run by the most direct route keeping the overall circuit length to a minimum.

3.3 PROTECTION OF BURIED CONDUCTORS:

- A. When conduits, or cables, are directly buried without concrete encasement, install permanently colored polyethylene, 0.004" film, marking tape, 6" wide above conduits or cables, and at 6" below finished grade. Tape shall incorporate wording similar to "CAUTION: BURIED ELECTRICAL LINES".

3.4 CABLE SUPPORT:

- A. Inside all manholes, all cables are to have racks with insulator supports. Supports are to be within 6" of each side of a splice and 3' centers.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART I – GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown on drawings.
- B. Ground circuits to limit excessive voltage from lightning, line surges, or unintentional contact with higher voltage and to limit the voltage to ground during normal operation.
- C. Ground conductive materials enclosing electric conductors or equipment or forming part of such equipment, to prevent voltage above ground on these enclosures.

PART 2 – PRODUCTS:

- 2.1 All grounding conductors shall be copper.
- 2.2 All grounding clamps, connectors, etc. shall be heavy-duty type.

PART 3 – EXECUTION:

3.1 GROUNDING SYSTEM:

- A. The following items shall be grounded
 1. Electric service and secondary of all transformers, except isolating type.
 2. Conduits and other conductor enclosures.
 3. Neutral conductor
 4. Panel Boards
 5. Grounding connection of convenience outlets, etc.
 6. Building steel

Note particularly NEC Art. 250 concerning grounding of all exposed non-current carrying metal parts of motors, lamps, appliances, fixtures, cabinets, cases and conduits.

- B. Ground conductors are required in all conduits.
- C. The cold water pipe shall be the primary electrode, using a grounding clamp. In addition, drive five 3/4" diameter, 10' long copper weld rods as a second grounding and connect to same ground point as water pipe ground. The ground conductor shall be No. 4/0 AWG bare copper, medium drawn, stranded or as required to conform to National Electrical Code.

- D. Make an approved ground connection to the main panel housing and connect to the neutral. Extend the ground bus conductor to this point.
- E. Use grounding clips and bonding jumpers to ground conduit where RGS or IMC conduit are used; ground devices with a grounding conductor.
- F. For transformer grounding, install a line looped to and connecting the secondary of all transformers.
- G. Ground the secondary neutral of each dry type transformer and each individual panel board enclosure with NEC sized ground wire.
- H. Building structure shall be grounded as noted and/or as shown on drawings.
- I. Provide one No. 6 TW copper wire in 1/2" conduit from the main telephone board and fire alarm control panel to the street side of the domestic water service (street side of main shut-off valve).

END OF SECTION

SECTION 26 05 33

RACEWAYS, FITTINGS, AND SUPPORTS

PART 1 – GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, material, etc. required to complete installation specified herein and/or shown or scheduled on drawings.
- B. Conduit size shall be 3/4" minimum; provide larger conduit where noted or required by N.E.C.
Exception: For switch legs with not more than 6-#12 conductors or 4-#10 conductors.

PART 2 – PRODUCTS:

2.1 CONDUIT:

Note: Non-metallic corrugated conduit (sometimes known as "blue pipe" or "smurf pipe") is not allowed on this project. All conduit shall be galvanized rigid steel, EMT, or PVC as noted below.

- A. For outside buried lines, use:
 - 1. PVC, Type EB, encased in concrete, or as noted on the drawings, or
 - 2. Rigid Galvanized Steel (RGS) conduit with bituminous coating, as noted on the drawings.
 - 3. All stub-ups and their associated elbows are to be RGS conduit with bituminous coating; do not rise above slab with PVC.
- B. Use RGS conduit in the following locations:
 - 1. Secondary Service Entrance
 - 2. Exposed Locations, below 6'-0"
 - 3. In or under concrete Floors
 - 4. Where conduit penetrates a fire-rated floor ceiling structure, and for all work below ground level.
 - 5. Panel board Feeders installed in concrete.
- C. Use Electrical metallic tubing (EMT) conduit in the following:
 - 1. Panel board feeders installed overhead
 - 2. Branch circuits installed overhead
 - 3. Branch circuits installed exposed above 6'-0"

- D. Galvanized single strip flexible steel conduit shall be used to make connections to motors or other vibrating equipment, and it may be used between conduit and lighting fixtures in ceiling.
- E. Flexible conduit connections shall not exceed 24" long for motors and 72" long for lighting fixtures. Flexible conduit may be used where required for connections in metal partitions or steel studs, where permitted by code. Maximum length shall be 24".
- F. Flexible watertight conduit shall be used for equipment connections exposed to possibility of water or other liquids. Conduit shall be PVC covered.
- G. Conduit fittings shall have same protective coating as conduit; rigid steel conduit fittings shall be threaded.
- H. Couplings, connectors and fittings for EMT shall be case hardened steel, rain-tight, designed specifically for use with EMT. Cast fittings (other than steel) will not be permitted. Split couplings shall be used where necessary to add conduit to inaccessible locations. All connectors shall be of the insulated throat type. Indented type fittings are not acceptable.
- I. Conduit connections to cabinets, boxes, etc. shall have grounding wedges, bushing, double locknuts. Install insulating bushings on all conduits.
- J. Plastic conduit: Schedule 40 PVC, 90 degree C., UL Listed conforming to NEMA Standards shall have a tensile strength of 7,000 psi at 73.4 degrees F., a flexural strength of 11,000 psi and a compressive strength of 8,600 psi. Conduit, fittings and cement shall be produced by same manufacturer who shall have 5 years experience manufacturing these products. Use beneath the slab only.

2.2 BOXES:

- A. Concealed boxes inside buildings, above grade: pressed steel, hot dipped galvanized at least 1-1/2" deep. Use gang boxes and plates where more than one device occurs at the same location. Outlets intended to support lighting fixtures shall be 4" octagonal X 2-1/8" deep, and where required, equipped with 3/8" fixture stud through bottom of box. Sectional switch boxes are not acceptable. Thru wall boxes are not acceptable.
- B. Boxes in exposed masonry: square, or rectangular, masonry module.
- C. Exposed units inside building: cast aluminum.
- D. Boxes, above grade, exposed to weather or dampness: cast aluminum with threaded hubs and watertight gasketed covers.

- E. Boxes flush with or below grade: Malleable iron with neoprene gasketed covers with self-retaining stainless steel screws.
- F. Provide blank covers, galvanized steel, for all outlet boxes left for future use.

2.3 WIREWAYS:

- A. Provide surface metal wire ways only where shown.
- B. Use junction boxes at conduit connections with suitable covers, elbows, special fittings, etc. as required or shown.
- C. Wire ways shall be surface-mounted, cold rolled galvanized steel with a base thickness of 0.05" and a cover thickness of 0.05". Outside surfaces of base and cover shall be ASA-61 gray. Where combination wire ways for low and high potential distribution are noted, compartments shall be divided by metallic dividers.
- D. Provide all necessary fittings including couplings, device plates, flat elbows, connectors, internal and external elbows, combination single receptacle and telephone outlet covers, combination duplex receptacle and telephone outlet covers, etc. as required for a complete installation.

PART 3 – EXECUTION:

3.1 CONDUIT:

- A. Conceal and run shortest practical path unless noted. Maximum run between junction pull boxes shall not exceed 100'. The conduit shall follow the routing described on the drawings as closely as possible. The routing and layout, however, is diagrammatic and where changes are necessary as a result of structural conditions, apparatus, or other causes, the routing shall be changed without additional cost to the owner. All conduit risers and offsets are not indicated on the drawings, but are intended to be installed as required.
- B. Provide conduit expansion joints at building structural expansion joints.
- C. In equipment rooms: conduits may be exposed, run parallel to building, cast aluminum boxes shall be used.
- D. Locate conduits at least 6" from any surface, which may be above 140°F.
- E. In general, conduits below floors shall be installed in floor slab and above the waterproofing with a minimum of 1-1/2" concrete above conduit. Where conduits are too large for encasement in normal slab, trench around conduit to provide a

minimum concrete encasement of 2". During construction, close conduit stub-ups, provide closure which:

1. Protect threads,
2. Keep dirt out,
3. Prevent entrance of water.

- F. Where groups of conduits terminate together or pass through floors, provide template to hold conduits in proper relation to each other and to building.
- G. Those conduits, which are to be left for future use, shall be tested for clean bore using a ball mandrel followed by 12 AWG copper wire, which shall be left in place.
- H. Circuits under 600 volts below grade outside of building shall have 24" of fill cover; above 600 volt, shall have 36" fill cover, measured from top of conduit.
- I. Conduit system shall be electrically and mechanically continuous from distribution center to final point of use.

3.2 BOXES:

- A. Boxes shall be flush with wall and/or ceiling and cover shall be accessible; use extension rings where needed. Boxes shall have no openings except those through which conduit passes. Boxes shall be secured to building structure.
- B. Prior to beginning work, coordinate the location of boxes in the block module with the Engineer's representative.

3.3 SUPPORTS:

- A. Outlets, junction, pull boxes, etc. when overhead, shall be independently supported and shall not depend upon conduit for support. Where a conduit run is not supported by slabs, walls, etc., use galvanized pipe straps, trapeze hangers, beam clamps, channel and fittings, etc. Support within 3' of each outlet box, junction box, cabinet or fitting. Support at least every 10', except per NEC for straight run.
- B. Anchors requiring explosive charges shall be used only after prior approval by Engineer. Phillips "Red Head" shields may be used for loads under 300 lbs.

3.4 PLASTIC CONDUIT (PVC):

- A. PVC conduits Schedule 40 heavy wall when used in lieu of RGS or EMT, for uses permitted by Section 2.01 I above shall be installed per NEC. Contractor must obtain approval of Engineer and the authority having jurisdiction prior to using plastic conduit in lieu of metallic conduit. Use PVC beneath slab only; do

not rise up into building envelope with PVC. In addition to NEC Paragraph 347-3, note the prohibited uses in Paragraph 517-11.

- B. Provide a grounding conductor per NEC in all plastic conduits.
- C. All joints shall be solvent welded per manufacturer's recommendations.
- D. Nylon pull cords shall be used instead of metal fish wires to pull in conductors.

END OF SECTION

SECTION 26 05 73

OVER-CURRENT PROTECTIVE DEVICES

PART 1 – GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on drawings.

PART 2 – PRODUCTS:

- 2.1 DISCONNECT MEANS: Non-fused safety switch, motor switch, or "Twist-Loc" receptacle.
- 2.2 SAFETY SWITCHES: NEMA Type HD; heavy duty; fusible except when used as disconnect only; enclosure with dual cover interlock; NEMA Type I indoors; NEMA Type 3R outdoors. Provide electrical interlock to break control circuits which would otherwise remain "hot"; actuate from switch mechanism.
- 2.3 FUSES: Motor circuit fuses to be dual element type, Class K5. All other fuses, unless noted to be NEMA Class H, general purpose, non-renewable type. All fuse clips shall be provided with fuses. All fuse clips for fuses rated above 10,000 AIC shall be rejection type. Furnish Owner one extra set of fuses of each size.
- 2.4 CIRCUIT BREAKERS: Quick-make and quick-break, thermal-magnetic type having trip free, automatic release by means of thermal elements in each phase. Breakers shall be permanent trip type, fully rated, and ambient temperature compensated. Marking showing ampacity shall be visible from front of unit. Breakers scheduled are sized for motors having no LR-KVA Code letter. Where installed motors have Code letter indicating LR-KVA, provide circuit protection per NEC Table 430-152.
- 2.5 GROUND FAULT PROTECTION, SERVICE ENTRANCE AND/OR MAIN FEEDERS: A ground sensor encircling all phase conductors including neutral in a 4-wire system connected to a solid state ground relay which initiates tripping of the main circuit interrupting device. Ground protection shall be adjustable from 200 to 3000 primary amperes and time-current characteristic shall provide 6-cycle operation at about ten-time settings. Relay output shall operate from 120V AC source.

PART 3 - EXECUTION

- 3.1 OVER-CURRENT PROTECTION: Thermal over-load trips, fuses, etc. shall be sized for the wire or motor being protected regardless of maximum size possible to install in unit.
- 3.2 TWIST-LOCK RECEPTACLE: Unless noted, on circuits serving 1/8 HP portable equipment, the disconnect means shall be a "twist-lock" receptacle.

END OF SECTION

SECTION 26 09 00

COMPLETION ITEMS

PART 1 – GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation specified herein and/or shown on scheduled drawings.

1.2 WIRING ELECTRICALLY OPERATED EQUIPMENT:

- A. Provide all conduit, conductors, wiring, etc. required to connect all electrically operated equipment installed, whether provided by this Division, other Divisions, or by Owner. Complete all circuits and leave in satisfactory operating condition. Install, support and connect starters, control devices, etc.
- B. For equipment furnished by other Divisions of this Contract, or by Owner, the control equipment shall be furnished by the other divisions or owners except that this Division furnishes the disconnect means and all components of life safety systems such as duct smoke detectors which are to be included with the building fire alarm system.
- C. Install disconnect means immediately ahead of, and in sight of, each piece of electrically operated equipment.
- D. All motors 1/2 HP and larger and all fixed appliances, or equipment, rated at 1.0 KW or larger shall be on individual circuits, except where several items are built into one piece of factory-assembled equipment.

PART 2 – PRODUCTS:

2.1 RECORD AND AS-BUILT DOCUMENTS:

- A. Maintain at job site a set of contract documents kept current by indicating thereon, all changes, substitutions, etc. between work as specified and as installed.
- B. Furnish Owner with one (1) complete set of reproducible drawings and one complete, clean sets of specifications showing installed locations, size, etc. of all work and material as taken from record documents.
- C. For each piece of equipment, provide three (3) sets of:
 - 1. Manufacturer's printed catalog pages, operating and maintenance instructions, wiring and connections diagrams, etc.

2. A list giving names and addresses of nearest supply house carrying spare parts for all equipment furnished and name of installation subcontractor with address and phone number.
- D. Bind this information into 8-1/2" x 11" booklet. One complete set shall be assembled in a loose-leaf ring or post hard-backed binder.

PART 3 – EXECUTION:

3.1 EQUIPMENT OPERATION:

- A. Operate all motors for at least one hour. During this time, check for proper lubrication, rotation and control operation. At the end of this hour's run, check for motor temperature.
- B. This Division is responsible for:
 1. Proper rotation,
 2. Observing that lubrication has been properly performed,
 3. Motors operate within nameplate limits,
 4. Overload heater elements are properly sized,
 5. Reporting observed discrepancies to the Engineer.
- C. On equipment furnished by other sections, if lubrication is not correct, or if motors do not operate within proper limits, this Division is responsible for notifying the General Contractor as to the deficiencies and for leaving the piece of equipment involved in a locked "OFF" condition.

3.2 SYSTEM BALANCE:

- A. Balance all circuits so that feeders, when fully loaded, shall be no more than 10% out of balance, phase-to-phase.

3.3 CIRCUIT CONTINUITY:

- A. Complete installation shall be free of short circuits, grounds and open circuits. Tests shall be made as required to prove that all parts of installation meet specified performances. Note Paragraph 110-7 of N.E.C. "Megger" tests shall be performed to assure proper insulation values and system integrity.
- B. Following the installation of all high voltage cables, prior to their final connections to switches, transformers, lightning arrestors, etc., D-C high potential tests shall be performed. All tests voltages and procedures are to meet cable and connector manufacturer's approval as well as the Utility supplying service. Following these tests, all final connections are to be made to switches, transformers, lightning arrestors, etc. and all circuits are to then be tested with a megohmmeter.

- C. All tests are to be properly recorded and submitted to the Engineer for record purposes.

3.4 OPERATING INSTRUCTIONS:

- A. When systems are completely adjusted, furnish personnel for one full day to instruct Owner's operators. Schedule instruction sessions with the Owner through the Engineer.

3.5 CLEANING:

- A. Fixtures, panels, equipment, etc. shall be free from any foreign matter and be thoroughly cleaned per manufacturer's printed instructions.

3.6 PAINTING:

- A. All equipment shall present a clean, painted appearance; touch-up or repair as required.
- B. Paint all ferrous metal, which is not otherwise protected against corrosion. Paint exposed pipe threads with Bitumastic No. 50.

3.7 IDENTIFICATION:

- A. Identify feeders by stenciling a legend on conduit in all exposed locations at 50' intervals. Letter height shall be 1/2 of conduit diameter, or 2", whichever is smaller.
- B. Identify all major items of equipment including controls, panels, and associated starters, switches, junction boxes, relays, etc. by 2-1/2" x 3/4" embossed nameplates, with wording approved by Engineer. Secure with screws or brad, adhesives alone are not acceptable.
- C. Nameplates after installation shall be easily visible from the floor and shall bear notations corresponding to those shown on record drawings.
- D. Identify location of outside underground conduits by:
 1. 4" x 4" x 12" concrete stakes, flush with finish grade, located above lines at ends and/or corners.
 2. 2" x 2" brass plates imbedded in building walls above conduits.

END OF SECTION

SECTION 26 12 00

UNDERGROUND SECONDARY ELECTRICAL SERVICE

PART 1 – GENERAL:

1.1 SCOPE:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on drawings.

1.2 CHARACTERISTICS:

- A. Service will be underground and will be available from pad-mounted transformer(s) furnished and installed by Power Company.
- B. Secondary Service Voltage will be:

480/277V - Three Phase, Four Wire, Wye.

1.3 METERING:

- A. Metering will be on the secondary of the transformers and will be located on the
 - 1. Transformer (confirm with utility).
- B. Meter Base will be supplied and installed by the contractor, co-ordinate details with utility. The meter will be provided by the power company.
- C. If current transformer metering is required, an 1-1/4" RGS conduit shall be furnished and installed by the contractor.
- D. Metering current transformers and metering conductors will be installed by the power company.

1.4 SECONDARY SERVICE CONDUCTORS AND CONDUITS:

- A. Secondary service conductors and conduit shall be furnished and installed by the contractor.
- B. Secondary conduits shall be run from the building main disconnect underground to the transformer, and shall terminate as directed by the power company.

PART 2 – PRODUCTS:

- 2.1 Products required for the service entrance are specified under the Basic Materials Sections of these specifications.

PART 3 – EXECUTION:

- 3.1 Contractor shall coordinate the service entrance with the power company and shall be guided by their rules and regulations. Any substantial deviations shall be reported to the Engineer immediately for directions.
- 3.2 The Electrical Contractor shall provide the power company with the load requirements and voltage characteristics so that the proper transformer(s) will be installed. Also, verify that fault current characteristics for service entrance equipment specified in Section 16400 meets local conditions.
- 3.3 Grounding shall be in accordance with ART. 250 of The National Electrical Code.

END OF SECTION

SECTION 26 20 00

PANEL BOARDS, WIRING DEVICES, PLATES & LV SWITCHING

PART 1- GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on drawings.

PART 2 - PRODUCTS:

2.1 PANEL BOARDS:

- A. Circuit Breakers - Quick-make, quick-break, thermal-magnetic, trip indicating, with common trip on all multi-pole breakers. Branch circuit breakers, feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip rating of the breaker in order to give "flash protection" for frayed stranded wire cords. Connections to the buss shall be of the Bolt-on Type. Where Noted Provide:
 1. Key Operation
 2. Built-In Ground Fault Circuit Interrupter on breakers
 3. Shunt Trip Breakers.
 4. Lock on Clips

All panel-mounted circuit breakers used to switch lighting circuits shall be UL listed SWD (switching duty) rated at applied voltage. All breakers used to serve package type air conditioning equipment shall be UL listed "HACR".

Verify with local utility that service entrance equipment meets fault current requirements of local conditions. Request instructions, prior to bidding, if discrepancies exist, or provide suitably rated equipment to match conditions.

- B. Ground Fault Circuit Interrupter - Shall be circuit interrupting; shall operate manually for normal switching functions and automatically under overload, short circuit, and .005 ampere line-to-ground fault conditions; shall provide circuit and self-protection; shall be of insulated cast construction; shall be interchangeable with other panel breakers, and shall not protrude into wiring space. Mechanism shall be trip-free against any abnormal over-current short-circuit or ground fault condition. The trip unit shall provide inverse time delay under overload conditions and instantaneous magnetic tripping for short-circuit protection. Additionally, unit shall sense line-to-ground faults, and open breaker contacts. The device shall be suitable for use on a system capable of delivering a

maximum of 10,000 (symmetrical) RMS amperes fault current at 120 volts, or as noted.

- C. Bus bar connections to the branch circuit breakers shall be "phase sequence" type. Three-phase, four-wire bussing shall be such that any three adjacent single-pole breakers are individually connected to each of the three different phases.
- D. Terminals shall be UL listed as suitable for the type of conductor specified.
- E. All lighting and distribution panel boards 600 amps or less shall have provisions for a sub-feed breaker equal to the size of the mains ratings.
- F. Enclose panel board bus assembly in dead-front type, galvanized steel cabinet, in accord with NEMA Standards No. PB1 and UL Standards No. 67.
- G. Fronts shall include doors and have flush, corrosion proof steel, cylinder locks with catches and spring-loaded door pulls. Fronts shall have adjustable indicating trim clamps, which are concealed when the doors are closed. Doors shall be mounted by concealed hinges. Fronts shall consist of a door, which covers the dead front and also a hinge where the entire cover can be swung open revealing the wiring gutter without removing the panel trim. Where the panel trims are flush mounted, a door in door front shall be used. The first door covers the dead front and the second door reveals the wiring gutter. Fronts that have to be removed to gain access to the full wiring gutter will not be accepted. Fronts shall not be removable with door in locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish. Minimum panel board width to be 20" for panel boards 250A and below, maximum width of 24" for 400A and 600A panel boards.
- H. Distribution power panel board fronts shall have a hinged gutter cover where all that is necessary to gain access to the wiring gutter is to remove two screws and the entire length of the gutter cover will open and expose the wiring gutter. Any gutter covers that have to be totally removed to expose the wiring will not be accepted. Hinged gutter covers to be a minimum of 9" wide, NO EXCEPTIONS.
- I. Provide 2-handle lock-off devices per panel to be installed where directed.
- J. Furnish 5 keys to panel board locks, all locks keyed alike.
- K. Where two or more panels are located at one point supply common trim.

- L. Directory cards shall be filled in on typewriter. Indicate circuit's use such as "Lighting-Office 105". Verify proper room identification.
- M. Ground fault protection, service entrance and/or main feeders: a ground sensor encircling all phase conductors including neutral in a 4-wire system connected to a solid state ground relay which initiates tripping of the main circuit interrupting device. Ground protection shall be adjustable from 200 to 1,200 primary amperes and time-current characteristic shall provide 6-cycle operation at about ten times setting. Relay output shall operate from 120V AC source.

2.2 INTEGRATED SURGE PROTECTIVE DEVICES:

A. References

1. ANSI/IEEE C62.41 - IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits
2. ANSI/IEEE C62.45-IEEE Guide for Surge Suppressor Testing
3. FIPS Pub 94 (1983) - Guide on Electrical Power for ADP Installation
4. National Electric Code - Article 280-1, 2, 4, 12, 21, 25
5. National Fire Protection Association - NFPA-20, NFPA-70, NFPA-75, NFPA-78.
6. NEMA LS-1 - Low Voltage Surge Protective Devices
7. UL 1283 - Electromagnetic Interference Filters
8. UL 1449 - Transient Voltage Surge Suppressor

B. Panel Boards

1. Integral Surge Suppressor-supplied with panelboard.
 - a. SPD shall be Listed and Component Recognized in accordance with UL 1449 and UL 1283.
 - b. SPD shall be installed by and shipped from the electrical distribution equipment manufacturer's factory.
 - c. SPD shall provide surge current diversion paths between each phase conductor and the neutral conductor, between each phase conductor and the ground and between the neutral conductor and ground.

2.3 WIRING DEVICE:

- A. Devices shall be specification grade and meet requirements of NEMA WDI "Heavy Duty". Acceptable manufacturers are: Hubbell, Pass & Seymour, and Leviton.
- B. Switches shall meet 50,000 close-open cycles of operation, and shall be rated for 120/277 volt, AC service. Switches shall be "T" rated.

- C. Receptacles shall have grounding terminal and shall be "self-grounding" except when "isolated ground" is noted.
- D. Devices shall be ivory color, or color as selected by architect.
- E. Plates shall be same manufacturer as devices and shall be 0.04 inch, stainless steel, satin finish, or Lexan plate as desired by Architect.

PART 3 – EXECUTION:

3.1 WIRING:

- A. Convenience outlets shall not be wired on same circuit with other type outlets unless specifically shown. Leave at least 8" of slack in conductors at every outlet box. In duplex receptacles mounted vertically, install with grounding pole above phase poles.
- B. Where a switch carries more than 1,440 watts on 120 volt circuit or 3300 watts on 277 volt circuit, provide 20 amp size switch, or larger as required.
- C. Provide 20 amp receptacles unless noted otherwise.
- D. Receptacles servicing equipment through exposed "pig-tails" shall be "twist-lock" type.
- E. Where more than one switch is at one location, gang-mount under common plate. Provide separating partitions for switches servicing 277-volt lighting circuits.
- F. Connect to live side of circuit, control only the outlet shown, lever in "down" position when "OFF".
- G. Secure switches firmly on boxes without depending on plates to draw them up tightly. Where several conductors must be held together, use nylon cable ties.
- H. Use shallow outlet boxes only where space conditions require it, and only after Engineer's approval.
- I. Unless otherwise noted, outlets shall be height above floor as follows: Switches up 48", receptacles up 18".
- J. Where ceiling outlets are "aligned", hold the fixture accurately to line.
- K. Switches shall be on strike side of door, and 4" from door trim unless otherwise noted.

- L. Where several outlets are shown close together to serve a particular piece of furniture or equipment, group closely as directed.
- M. Devices shall not be mounted back back. A minimum, of two feet (2') shall separate devices on opposite sides of any wall.

3.2 BRANCH CIRCUITS:

- A. Multi-wire, 120-volt circuits on a common neutral and in one conduit can be used without change in wire size up to #3 on 120-208V, 3 Phase wye service and 2 circuits on 120-240V, 3 phase, and delta service. Where it will be of advantage, provided the wire is increased one size and two neutrals are used, 6 circuits on 120-208V, 3 phase, wye are acceptable in one conduit.

3.3 WIRING IN AIR HANDLING SPACES:

- A. In connection with wiring in ducts, plenum and other air handling spaces, note the requirements in the National Electrical Code.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS:

- A. Division-26 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of panelboard, load-center and enclosure work is indicated by Drawings and schedules.
- B. Types of panelboards and enclosures in this section include the following:
 - 1. Power-Distribution Panelboards
 - 2. Lighting and Receptacle Panelboards
- C. Refer to other Division-26 sections for cable/wire, connectors, and electrical raceway work required in conjunction with panelboards and enclosures.

1.3 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than five years.
- B. NEC Compliance: Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with NEC requirements pertaining to installation of wiring and equipment in hazardous locations.
- C. UL Compliance: Comply with applicable requirements of STd. No. 67, "Electric Panelboards", and Stds. No.'s 50, 486B, and 1053 pertaining to panelboards, accessories and enclosures. Provide units which are UL-listed and labeled.
- D. Special-Use Markings: Provide panelboards, constructed for special-use, with appropriate UL marks which indicates that special type of use/application.
- E. NEMA Compliance: Comply with NEMA Stds. Pub/No. 250, "Enclosures for Electrical equipment (1000 Volts Maximum)", Pub/No. PB1,

"Panelboards", and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".

- F. Federal Specification Compliance: Comply with FS W-P-115, "Power Distribution Panel", pertaining to panelboards and accessories.
- G. Each panelboard as a complete unit shall have a short circuit rating equal to greater than the rating indicated on drawings. Where series ratings with main breaker and/or upstream devices are employed, the panel shall include a prominently displayed label indicating UL listed series ratings and state "Caution – Series Combination System Rated _____Amperes Identified Replacement Components Required".

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's data on panelboards.

PART 2 – PRODUCTS:

2.1 LIGHTING AND POWER PANELS:

- A. Furnish and install panelboards mounted in enclosing cabinets on which shall be mounted equipment as shown on the Drawings, specified or required.
- B. Panelboards shall be dead front type and equipped with thermal magnetic molded case circuit breaker units, as indicated.
- C. Cabinets shall be galvanized, code gauge, sheet steel complete with flush or surface type trim as indicated and shall be a minimum of 17" wide and 5-3/4" deep. Frames shall be column type where indicated on the Drawings.
- D. Provide adequate wiring and gutter space and a means for circuit identification. Provide a glazed, typewritten circuit directory.
- E. Breakers shall be common trip, bolt type, rated XXX amperes interrupting capacity per panel schedule.
- F. Circuit breakers shall be rated for protection of load designated to serve:

| <u>Load Type</u> | <u>Circuit Breaker Rating</u> |
|-----------------------------------|-------------------------------|
| Heating, AC, Refrigeration, Motor | HACR |
| Fluorescent, HID Lighting | HID |
| Panel Light Switching | Switch Duty |
| Dimmers, Neon, Transformer | High Magnetic IN Rush |

- G. Lighting panelboards shall be Square D Type NF, or Engineer approved equal by Siemens, General Electric or Cutler-Hammer.
- H. Panelboards shall be designed for 277/480 volts, three-phase, four-wire service;
OR
Panelboards shall be designed for 208/120 volts, three-phase, four-wire service, per plans.
- I. Provide flush doors with lock and keys. Provide two keys for each panel. All locks shall be keyed alike.
- J. Bussing
Copper sized in accordance with UL 67 standards for temperature rise.
- K. Ground Bars
Non-insulated copper equipment ground bar will be provided.
- L. Neutrals
Neutral bussing shall have a lug for each outgoing branch requiring a neutral connection; load side neutral connection lugs to be split with each side taking 50% of load neutral connections.
- M. Panelboard Trims
All Panelboard Construction shall include optional Door-In-Door Trim Assemblies with Piano Hinge Type on both inner and outer Doors.
Eaton "EZ Trim" – Door in Door Trip Shall Not Be Accepted, No Exception.
- N. Surge Device
See Section 26 43 13. All Surge Units must be manufactured by the same manufacture as the panelboard manufacture and internally mounted. It shall be listed in accordance with UL 67, 1283 and 1449. Designed and tested in accordance with ANSI/IEEE C62.45 and C62.41.

2.2 RECEPTACLE PANELS:

- A. Furnish and install panelboards mounted in enclosing cabinets on which shall be mounted equipment as shown on the Drawings, specified or required.
- B. Panelboards shall be dead front type and equipped with thermal magnetic molded case circuit breaker units, as indicated.
- C. Cabinets shall be galvanized, code gauge, sheet steel complete with flush or surface type trim as indicated and shall be a minimum of 17" wide and

5-3/4" deep. Frames shall be column type where indicated on the Drawings.

- D. Provide adequate wiring and gutter space and a means for circuit identification. Provide a glazed, typewritten circuit directory.
- E. Breakers shall be common trip, bolt type, rated XXX amperes interrupting capacity per panel schedule.
- F. Circuit breakers shall be rated for protection of load designated to serve:

| <u>Load Type</u> | <u>Circuit Breaker Rating</u> |
|-----------------------------------|-------------------------------|
| Heating, AC, Refrigeration, Motor | HACR |
| Fluorescent, HID Lighting | HID |
| Panel Light Switching | Switch Duty |
| Dimmers, Neon, Transformer | High Magnetic IN Rush |

- G. Receptacle panelboards shall be Square D Type NQ, or Engineer approved equal by Siemens, General Electric or Cutler-Hammer.
- H. Panelboards shall be designed for 120/208 volts, three-phase, four-wire service;
OR
Panelboards shall be designed for 277/480 volts, three-phase, four-wire service, per plans.
- I. Provide flush doors with lock and keys. Provide two keys for each panel. All locks shall be keyed alike.
- J. Bussing
Copper sized in accordance with UL 67 standards for temperature rise.
- K. Ground Bars
Non-insulated copper equipment ground bar will be provided.
- L. Neutrals
Neutral bussing shall have a lug for each outgoing branch requiring a connection; load side neutral connection lugs to be split with each side 50% of load neutral connections.
neutral taking
- M. Panelboard Trims
All Panelboard Construction shall include optional Door-In-Door Trim Assemblies with Piano Hinge Type on both inner and outer Doors.
Eaton "EZ Trim" – Door in Door Trip Shall Not Be Accepted, No Exception.

N. Surge Device

See Section 26 43 13. All Surge Units must be manufactured by the same manufacture as the panelboard manufacture and internally mounted. It shall be listed in accordance with UL 67, 1283 and 1449. Designed and tested in accordance with ANSI/IEEE C62.45 and C62.41.

PART 3 – EXECUTION:

3.1 INSTALLATION:

- A. Panels shall be mounted 48" to the centerline or lower with the top of the cabinet a maximum of 6'-0" above floor level. Panels in dwelling units shall be mounted with the top of the cabinet 5'-0" above floor level.
- B. All panels shall be identified with embossed plastic nameplates.
- C. Bonding and Grounding: The main panel shall be the only panel where the panel neutral bar is bonded to the panel enclosure. All other neutral bars shall be isolated from the panel enclosures.
- D. Panelboards shall be set on a high concrete pad extending 2-1/2" beyond all accessible sides with 45% degree chamfered edges.

END OF SECTION

SECTION 26 28 16

DISCONNECT SWITCHES

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS:

- A. Division-26 Basic Electrical Materials and Methods sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of circuit and motor disconnect switch work is indicated by Drawings and schedules.

1.3 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required, whose products have been in satisfactory use in similar service for not less than three years.
- B. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.
- C. UL Compliance: Comply with requirements of UL 98, "Enclosed and Dead-Front Switches". Provide circuit and motor disconnect switches which have been UL-listed and labeled.
- D. NEMA Compliance: Comply with applicable requirements of NEMA Stds Pub No. KS 1, "Enclosed Switches" and 250, "Enclosures for Electrical Equipment (1000-Volts Maximum).

PART 2 – PRODUCTS:

2.1 SWITCHES:

- A. Switches shall be heavy duty as manufactured by Square D Company, Type HD, or Engineer approved equal by General Electric, Siemens, or Cutler-Hammer, and shall have the capability to be locked in either the "ON" or "OFF" positions.
- B. All switches shall be fused or non-fused, as indicated with quick-make, quick-break mechanism, full cover interlock, horsepower rated and enclosed

in a NEMA 1 enclosure unless otherwise noted on the Drawings or herein the Specifications.

- C. Switches shall have rejection type fuse clips to accommodate Type R fuses only.

PART 3 – EXECUTION:

3.1 INSTALLATION:

- A. Furnish and install all switches and fuses as shown on the Drawings, specified or required.
- B. Each disconnecting means required by this standard for motors and appliances, and each service, feeder, or branch circuit at the point where it originates, shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident.

END OF SECTION

SECTION 26 43 13

SURGE PROTECTIVE DEVICES

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS:

- A. Division-26 Basic Electrical Materials and Methods sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of surge protective devices is indicated on the drawings.
- B. Types of surge protective devices specified in this section include the following:
 - 1. Service Entrance Surge Protective Devices
 - 2. Distribution Panel Surge Protective Devices
 - 3. Branch Panel Surge Protective Devices

1.3 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in the manufacture of surge protective devices, whose products have been in satisfactory use in similar service for not less than five years.
- B. NEC Compliance: Comply with NFPA 70, Article 285 applicable to wiring methods, construction and installation of surge protective devices. Comply with Articles 285, 700, and 708 as applicable to surge protective devices.
- C. UL Compliance: Comply as applicable to UL 1449 3rd edition, UL 1283, and UL96A standards pertaining to surge protective devices.
- D. ANSI/IEEE Compliance: Comply with applicable current requirements of ANSI/IEEE standards C62.1, C62.41, C62.45, C62.62 and IEEE 1100-2005 pertaining to surge protective devices.

1.4 GLOSSARY AND ACRONYMS:

- A. SPD: Surge Protective Device(s), both singular and plural.
- B. Voltage Protection Rating (VPR): Underwriters Laboratories SPD performance rating assigned after being subject to 6kV, 3kA impulses.

- C. Maximum Continuous Operating Voltage (MCOV): The maximum designated root mean-square (rms) value of the power frequency voltage that may be continuously applied to the mode of protection of an SPD.
- D. Nominal Discharge Current (In): Peak value of the current, selected by the manufacturer from a list of values specified in ANSI/UL 1449-2006, through the SPD having a current waveshape of 8/20 where the SPD remains functional after 15 surges using the test procedure described in ANSI/UL 1449-2006.
- E. Type 1 SPD: Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service equipment overcurrent device, as well as the load side, including watt-hour meter socket enclosures and intended to be installed without an external overcurrent protective device.
- F. Type 2 SPD: Permanently connected SPDs intended for installation on the load side of the service equipment overcurrent device; including SPDs located at the branch panel.
- G. Type 4 intended for Type 1 or Type 2 applications: Recognized Component SPDs, including discrete components as well as component assemblies, which bear specific conditions of acceptability.
- H. Modes Of Protection: Electrical paths where the SPD offers defense against transient overvoltages. e.g. Each Line to Neutral (L-N), Line to Ground (L-G), Line to Line (L-L) and Neutral to Ground (N-G).
- I. 'Discrete' or 'True' 10-Mode Protection: This style of SPD configures discrete surge protective elements connected across each Line to Neutral (L-N), Line to Ground (L-G), Line to Line (L-L) and Neutral to Ground (N-G) paired conductors.
- J. Per Phase Ratings: 'Per-Phase' ratings for a three-phase Wye-connected SPD are determined by multiplying the kA per mode times the number of discrete modes of protection (directly connected suppression components), minus the value for the Neutral to Ground mode, divided by the number of phases.

$$\text{Per-Phase} = \{[(\text{kA per mode}) \times (\# \text{ of modes})] - (\text{N-G mode kA})\} / (\# \text{ of phases})$$

1.5 WARRANTY:

- A. The manufacturer shall warranty the surge protective device against failure for a period of ten years from date of acceptance by the Owner. Upon

notice from the Owner, the manufacturer shall remedy all such defects at his own expense at a time convenient to the Owner.

- B. The Electrical Contractor shall warranty the installation of the surge protective devices for a period of one year from date of acceptance by the Owner. Upon notice from the Owner, the Electrical Contractor shall remedy all such defects at his own expense at a time convenient to the Owner.

1.6 LEED REQUIREMENTS:

- A. The materials/products/methods specified in this section have an impact on the Project's LEED requirements. The General Contractor shall verify and document the contribution of the materials/products/methods provided to the Project's LEED requirements. This contribution shall be documented as specified in this section, Division 01 section Sustainable Architecture and LEED Requirements, Division 01 section Construction Waste Management, and as required in the LEED 2009 for New Construction and Major Renovation, and errata. LEED requirements impacted by this section are:
 1. Credit MR2: Construction Waste Management. See Division 01 Section Construction Waste Management for construction waste management requirements.
 2. Credit MR5: Regional Materials.
 3. Credit EQ4.1: Low Emitting Materials, Adhesives & Sealants.
 4. Credit EQ4.2: Low Emitting Materials, Paints & Coatings.

1.7 SUBMITTALS:

- A. Shop Drawing: Submit shop drawings and product information for approval and final documentation in the quantities listed according to the Conditions of the Contract. All transmittals shall be identified by customer name, customer location, and customer order number.
- B. Product Data: Submittals shall include UL 1449 3rd Edition Listing documentation verifiable by visiting www.UL.com, clicking "Certifications" link, searching using UL Category Code: VZCA.
 1. Short Circuit Current Rating (SCCR)
 2. Voltage Protection Ratings (VPRs) for all modes
 3. Maximum Continuous Operating Voltage rating (MCOV)
 4. I-nominal rating (I-n)
 5. SPD shall be Type 1 UL listed and labeled
- C. Validation: Letter from manufacturer stating products are in strict compliance with the recommendations of IEEE Std 1100-2005, Clause 8.6.1. and incorporate 10 individual dedicated discrete modes of protection for three-phase wye systems, including direct Line-to-Line components. (Reduced-Mode variations will not be accepted).

- D. Equipment Manuals: Submit a manufacturer's installation manual with installation, start-up, spare parts list, and operating instructions.

1.8 QUALITY ASSURANCE:

- A. **Manufacturer Qualifications:** Engage a firm with at least ten (10) years of experience in manufacturing surge protective devices (SPDs). When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- B. Manufacturer shall be ISO 9001 or 9002 certified.
- C. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

PART 2 – PRODUCTS:

2.1 LEED MATERIAL REQUIREMENTS:

- A. Products and materials provided in this section shall comply with and contribute to the Project's LEED requirements. LEED requirements are as indicated in this section and as specified in Division 01 section Sustainable Architecture and LEED Requirements. Contributions to LEED requirements shall be documented as indicated in the submittals paragraph of this section and as specified in Division 01 section Sustainable Architecture and LEED Requirements.

2.2 SERVICE ENTRANCE SURGE PROTECTIVE DEVICES:

- A. Surge Protective Devices (SPD) installed on the service entrance shall be designed for a 277/480V-3PH-4W or 120/208V-3PH-4W, sixty-cycle service. The SPD shall have an integral disconnect mounted in the entry door.
- B. SPD shall be UL 1449 labeled as Type 1 or Type 4 intended for Type 1 or Type 2 applications, verifiable at UL.com, without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
- C. SPD shall be integrally within host electrical distribution equipment.

- D. SPD shall be UL labeled with 20kA I-nominal (I-n) (verifiable at UL.com) as recommended for UL 96A Lightning Protection Master Labeling and NFPA 780.
- E. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR).
- F. True 10-Mode Protection paths: SPD shall provide “directly connected protection elements” between all possible modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.
- G. SPD shall be connected to the buss of the distribution equipment with an appropriately sized 200kA SCCR rated disconnect.
- H. SPD shall meet or exceed the following criteria:
 - 1. Maximum surge current capability shall be 300kA per phase.
 - 2. UL 1449 - Third Edition Revision; effective September 29, 2009 Voltage Protection Ratings shall not exceed the following:

| <u>VOLTAGE</u> | <u>L-N</u> | <u>L-G</u> | <u>N-G</u> | <u>L-L</u> | <u>MCO</u> <u>V</u> |
|----------------|------------|------------|------------|------------|------------------------|
| 208Y/120 | 700V | 700V | 700V | 1000V | 150V |
| 480Y/277 | 1200 | 1200V | 1200V | 1800V | 320V |

- 3. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

| <u>System Voltage</u> | <u>Allowable System Voltage Fluctuation (%)</u> | <u>MCOV</u> |
|-----------------------|---|-------------|
| 208Y/120 | 25% | 150V |
| 480Y/277 | 15% | 320V |

- 4. SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of - 50dB at 100 kHz.
- 5. Suppression components shall be heavy duty ‘large block’ MOVs, each exceeding 30mm diameter.
- 6. SPD shall include a serviceable, replaceable module.
- 7. SPD shall be equipped with the following diagnostics:
 - a.) Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
 - b.) Audible alarm with on/off silence function and diagnostic test function (excluding branch).
 - c.) Form C dry contacts
 - d.) Surge Counter

- 8. The SPD shall be as manufactured and supplied by Siemens, Schneider Electric, Eaton, or GE.

2.3 DISTRIBUTION PANEL SURGE PROTECTIVE DEVICES:

- A. Surge Protective Devices (SPD) installed on the service entrance shall be designed for a 277/480V-3PH-4W or 120/208V-3PH-4W, sixty-cycle service.
- B. The SPD shall be internally mounted within distribution panels direct bussed connected at the end of the buss opposite of the main feed. SPD shall not take up any unit or occupy any gutter space.
- C. SPD shall be UL 1449 labeled as Type 1 or 2 or Type 4 intended for Type 1 or Type 2 applications, verifiable at UL.com, without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
- D. SPD shall be integrally within host electrical distribution panelboards. The unit shall be top or bottom feed according to requirements. A circuit directory shall be located inside the door.
- E. The panelboard shall be UL 67 Listed and the SPD shall be UL 1449 labeled as Type 1 or as Type 4 intended for Type 1 or Type 2 applications.
- F. SPD shall be UL labeled with 20kA I-nominal (I-n) (verifiable at UL.com) as recommended for UL 96A Lightning Protection Master Labeling and NFPA 780.
- G. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR).
- H. True 10-Mode Protection paths: SPD shall provide “directly connected protection elements” between all possible modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.
- I. SPD shall meet or exceed the following criteria:
 - 1. Maximum surge current capability shall be 150kA per phase.
 - 2. UL 1449 - Third Edition Revision; effective September 29, 2009 Voltage Protection Ratings shall not exceed the following:

| <u>VOLTAGE</u> | <u>L-N</u> | <u>L-G</u> | <u>N-G</u> | <u>L-L</u> | <u>MCO</u> <u>V</u> |
|----------------|------------|------------|------------|------------|------------------------|
| 208Y/120 | 700V | 700V | 700V | 1000V | 150V |
| 480Y/277 | 1200 | 1200V | 1200V | 1800V | 320V |

V

3. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

| <u>System Voltage</u> | <u>Allowable System Voltage Fluctuation (%)</u> | <u>MCOV</u> |
|-----------------------|---|-------------|
| 208Y/120 | 25% | 150V |
| 480Y/277 | 15% | 320V |

4. SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of - 50dB at 100 kHz.
5. Suppression components shall be heavy duty 'large block' MOVs, each exceeding 30mm diameter.
6. SPD shall include a serviceable, replaceable module.
7. SPD shall be equipped with the following diagnostics:
- a.) Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
 - b.) Audible alarm with on/off silence function and diagnostic test function (excluding branch).
 - c.) Form C dry contacts

- J. The SPD shall be as manufactured and supplied by Siemens, Schneider Electric, Eaton, or GE.

PART 3 – EXECUTION:

3.1 INSTALLATION:

- A. Install per manufacturer's recommendations and contract documents.

3.2 ADJUSTMENTS AND CLEANING:

- A. Remove debris from installation site and wipe dust and dirt from all components.
- B. Repaint marred and scratched surfaces with touch up paint to match original finish.

3.3 TESTING:

- A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacture's recommendations.

B. Check all installed panels for proper grounding, fastening and alignment.

3.4 WARRANTY:

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

END OF SECTION

SECTION 26 50 00

BUILDING LIGHTING AND LAMPS

PART 1 – GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide labor, material, equipment and services necessary to provide all interior lighting fixtures, necessary hangers and lamps. Fixtures include all interior fixtures plus all exterior fixtures mounted to exterior wall or to structures connected directly to building.
- B. Fluorescent fixtures to be designed in such a manner that all electrical components may be replaced without disturbing fixture in or on ceiling.
- C. Ballasts shall have overall power factor of more than 90%. Ballasts noise shall be inaudible in a room ambient of 35 DB.

PART 2 – PRODUCTS:

- 2.1 Provide lighting fixtures indicated by type on lighting fixture schedule on Drawing.
- 2.2 Recessed fluorescent fixtures shown with acrylic lenses to be furnished with 0.125 minimum thickness acrylic lenses.
- 2.3 Fluorescent ballasts to be electronic energy saving, high-power factor and bear ETL and CBN labels for Class "P" protection and shall be rated for 110/125-volt operation unless noted otherwise.
- 2.4 Provide one ballast per fixture unless otherwise noted on plans for multi-level switching.
- 2.5 Provide all fluorescent, high intensity discharge and incandescent lamps as indicated below.
- 2.6 FLUORESCENT LAMPS:
 - A. Fluorescent lamps to be 32 watt T8 or 28 watt T5, unless noted otherwise.

2.7 LED LUMINAIRES:

A. Definitions:

1. Driver - the power supply used to power LED luminaires, modules, or arrays.
2. L70, L70, or L70% - The reported life of an LED component or system to reach 70% lumen maintenance, or 70% of the LED's original light output. This test is being developed by the IES and is currently described by TM-21-11.
3. LED's - Broadly defined as complete luminaire with light emitting diode (LED) packages, modules, light bars or arrays, complete with driver.
4. LED luminaire failure - Negligible light output from more than 10 percent of the LED's constitutes luminaire failure.

B. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category are:

1. Minimum Light Output.
2. Zonal Lumen Requirements.
3. Minimum Luminaire Efficacy.
4. Minimum CRI.
5. L70 Lumen Maintenance.
6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED components.

C. Additional Requirements:

1. Color Temperature of 3000K-4100K for interior luminaires as listed in the Luminaire Schedule on the plans. The color temperature of exterior LED luminaires should not exceed 4100K (nominal).
2. Color Consistency: LED manufacturer shall use a maximum 3-step MacAdam Ellipse binning process to achieve consistent luminaire-to-luminaire color for interior luminaires. Exterior luminaires shall use a maximum 5-step MacAdam Ellipse binning process.
3. Glare Control: Exterior luminaires shall meet DesignLights Consortium's® criteria for Zonal Lumen Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior luminaires.
4. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
5. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
6. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
7. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.

8. Driver shall have a rated life of 50,000 hours, minimum.
 9. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
 10. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
 11. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior luminaires, and a minimum of 70 for exterior luminaires.
 12. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
 13. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
 14. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
 15. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
 16. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
 17. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
 18. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient
 19. (PTC)-protected as per Class 2 UL listing.
 20. All luminaires shall be provided with knockouts for conduit connections.
 21. The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
 22. Provide all of the following data on submittals:
 - a. Delivered lumens
 - b. Input watts
 - c. Efficacy
 - d. Color rendering index.
- D. LED Luminaires used for Emergency Egress Lighting:
1. The failure of one LED shall not affect the operation of the remaining LEDs.
- E. Emergency LED Luminaire Compatibility with Inverters:
1. Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire manufacturer that the luminaire will function with a square-wave inverter.

- F. Dimming:
1. LED driver shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM) operation.
 2. LED luminaires shall dim to (20%, 15%, 10%, 5%, or 0.1%) as specified in the Luminaire Schedule on the plans without visible flicker or “popcorn effect”. “Popcorn effect” is defined as the luminaire being on a pre-set dimmed level (less than 100%), and going to 100% prior to returning to the pre-set level when power is returned to the luminaire.

2.8 MISCELLANEOUS LAMPS:

- A. Incandescent lamps to be rated at 130-volts, inside frosted, unless specifically called for otherwise by manufacturer or listed otherwise in fixture schedule.

2.9 EXIT LIGHTS:

- A. Exit lights shall have LED lamps nickel cadmium battery, charger, and 120/277V electronic circuitry. Directional arrows per drawings.

2.10 FLUORESCENT EMERGENCY BATTERIES

- A. Emergency illumination shall be provided by using a standard fluorescent fixture equipped with fluorescent emergency ballast. Supply and install for each designated fixture, a fluorescent emergency ballast consisting of a special high temperature nickel cadmium battery, charger, and electronic circuitry contained in one (1) compact steel case.
- B. A test switch, installation hardware and a charging indicator light, to monitor the charger and battery, shall be provided.
- C. The battery unit shall be installed within the fixture ballast channel or outside the channel requiring an external mounting kit. Every emergency ballast shall be capable of fully automatic operation of one (1) 2' through 8' lamp, or two (2) 2' through 4' lamps in the emergency mode at reduced illumination. Emergency illumination shall be a minimum of 650 lumens for ninety (90) minutes.

PART 3 – EXECUTION:

- 3.1 Recessed fixtures in dropped ceiling areas to be connected using Greenfield and No. 14 AF wire. Greenfield to be connected to fixture and cover of outlet box. Each piece of Greenfield to have installed in it a separate insulated green grounding conductor not smaller than No. 14 AWG for grounding continuity between fixture and conduit system. Grounding conductor to be mechanically connected in a permanent and effective manner to fixture and conduit system

and to be electrically continuous. No conduit shall enter a recessed fixture directly as this would prevent removal of fixture without disturbing balance of circuit.

- 3.2 Joints in fixture wiring to be made using wire nuts, pre-insulated Scotch locks, Ideal No. 30-410 crimps and No. 30-415 wrap caps, or other approved mechanical means of connection.
- 3.3 Adjustable type to be adjusted by the Contractor to illuminate intended area to satisfaction of Owner.
- 3.4 Any adjustable outside area lights or lights mounted on building to be adjusted at night by the Contractor to satisfaction of Owner.
- 3.5 Surface or recessed fixtures in or on plastered or dry wall ceiling to be supported from pieces of support channel spanning across main support channels and shall not depend on ceilings for support. Fixtures in plastered ceilings to have plaster frames.
- 3.6 Coordinate with ceiling tradesman and Contractor in order that proper fixtures are furnished to match ceiling suspension system being installed.
- 3.7 Coordinate fixture locations to clear diffusers, ductwork, piping, etc.
- 3.8 Maintain integrity of parabolic lensed fixtures by leaving the protective wrapping or seal on until final inspection.
- 3.9 Maintain integrity of enclosures on all enclosed and gasketed fixtures. Minimize number of enclosure penetrations and make such penetrations water and dust tight with appropriate gasketing and fittings.
- 3.10 Submit for approval prior to purchasing fixtures complete fixture lists of fixtures proposed to be used. Include cuts of both specified fixture and proposed equivalent features if fixtures other than those specified are submitted.
- 3.11 If requested by Architect, submit a sample fixture, which will be returned after inspection by Architect. Architect reserves right to accept any fixture as approved equivalent.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING AND LAMPS

PART 1 – GENERAL:

- 1.1 Provide labor, materials, equipment and services necessary for installation of all exterior lighting fixtures, lamps, poles, pole bases etc. for area lighting.
- 1.2 Refer to details and arrangements shown on drawings.
- 1.3 Provide anchor bolts, conduit stub-ups to pole bases, concrete bases, etc. as required for poles and luminaries and types of arrangements indicated.
- 1.4 Provide exterior lighting fixtures and poles indicated by type on lighting fixture schedule on drawings.
- 1.5 Fixture manufacturer to furnish sufficient amount of paint (matching fixtures being furnished) for adequate field painting of prime painted poles being furnished.

PART 2 – PRODUCTS:

- 2.1 Fixtures, poles, etc. to be suitable for exterior use, shall be UL listed, and to be of standard design.

PART 3 – EXECUTION:

- 3.1 Install parking luminaries and poles on concrete bases. Provide all anchor bolts and bolt hole circle templates. Adjust luminaries to correct tilt and lamp all fixtures.
- 3.2 Adjust or rotate [roadway and flood lighting at night to maximize light utilization in intended areas.
- 3.3 Effectively ground all luminaries to poles and all poles to equipment grounding conductor or to separate 3/4" diameter x 8' copper weld ground rod driven at base of each pole.

- 3.4 Submit for approval prior to purchasing fixtures complete shop drawings and brochures including photometrics for each type of exterior lighting system specified. Shop drawings and brochures to be specific and to include all pertinent data and accessories. If substitute fixtures are proposed include cuts of both specified fixture and proposed equipment fixtures if requested by Engineer. Submit a sample fixture, which will be returned after inspection by Engineer. Engineer reserves right to accept any fixture as an approved equivalent.

END OF SECTION

SECTION 27 00 01

COMMUNICATIONS GENERAL PROVISIONS

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS:

- A. Drawings, bidding requirements, contract forms and conditions of the Contract, including the Instructions to Bidders, General Conditions, Supplementary Conditions, and Division- 01 Specification Sections, apply to work of this Division.

1.2 IMPOSED REGULATIONS:

- A. Applicable provisions of the State and Local Codes and of the following codes and standards are hereby imposed on a general basis for electrical work:
 1. NEC, National Electrical Code (NFPA No. 70), 2017 Edition.
 2. The Life Safety Code (NFPA No. 101, 2006 Edition.
 3. ADA Accessibility Guidelines for Building and Facilities, 2003 Edition.
 4. The International Building Code, 2006 Edition.
 5. EIA/TIA Telecommunications Standards.
 6. The International Fire Code (NFPA 72), 2006 Edition.

1.3 SCOPE OF WORK:

- A. All communications cabling and equipment including voice, data, intercom, CATV, and security cameras where applicable, will be provided and installed under a separate bid package issued by Hamilton County Telecommunications Office.
- B. The General Contractor, through the appropriate subcontractors, will be responsible for providing and installing all conduit, conduit sleeves, wall penetration systems, gang boxes, overhead cable tray, junction boxes, electrical outlets, grounding, plywood and any other items as shown on all electrical and communications drawings for communications devices including voice, data and intercom, CATV, and security cameras where applicable.

1.4 PROJECT STAFFING:

- A. The Contractor shall provide a superintendent to supervise all work performed under this contract the superintendent shall have a minimum of 5 years experience in the supervision of educational projects of similar size. The Superintendent shall have a State of Tennessee Unrestricted low voltage license. The Contractor shall submit a resume for the proposed superintendent, for approval of the Architect, prior to beginning work.

1.5 INSTALLER QUALIFICATIONS:

- A. All systems shall be installed by Technicians who are authorized representatives of the system manufacturer.
- B. Helpers may assist Technicians in the installation of cables but shall not be allowed to install devices, make equipment connections or perform other work for which they are not qualified.

1.6 COORDINATION:

- A. Coordinate work provided under this division of the specifications with work provided under other divisions of the specifications and work provided by Owner, where applicable. Outlet boxes and raceway systems and line voltage power connections shall be installed by Division 26. All equipment and system wiring shall be provided under this division of the specifications.

1.7 DIVISION 27 DRAWINGS:

- A. Contract Electrical drawings showing Division 27 devices and equipment are diagrammatic and indicate the general arrangement of equipment. Do not scale plans. Obtain all dimensions from the Architects' dimensioned drawings and field measurements. The Contractor shall review Architectural plans for door swings and built-in equipment; conditions indicated on those plans shall govern for this work.
- B. Discrepancies shown on different drawings, between drawings and specifications, or between documents and field conditions shall be brought to the attention of the Architect.

1.8 LABELING:

- A. Provide labels for devices, equipment and cables in accordance with the specifications. Room numbers to be used for labeling shall be disclosed by the Owner. Do not use room numbers shown on the drawings.

PART 2 - PRODUCTS:

2.1 MATERIALS AND APPARATUS:

- A. Overhead Cable Management
 - 1. An overhead cable management system will be utilized to support the weight of all communications cabling (voice, data, intercom, and CATV) between communications closets and classrooms or other utilization points.

2. A 2" deep x 12" wide flexible wire cable tray, manufactured by WBT or Wire Maid with black powder coat finish, shall be provided and installed by the electrical contractor under this General Contract. All cable trays shall be divided into two (2) sections using factory dividers. Section 2 shall be 10 inches wide measured from the corridor. This section shall be for voice, data and speaker cabling. Section 1 shall be the remaining 2 inches of tray measured from second divider. This section shall be used for low-voltage BAS systems, fire alarm and security systems only. The cable tray must be located at a minimum of 3 inches and a maximum of 6 inches above the ceiling grid. A minimum of 12 inches clearance above and adjacent to the tray on the corridor side shall be open and accessible. No piping, ductwork, conduit, etc. shall run parallel above the cable tray and may only cross the tray at right angles maintaining the 12-inch clearance. The cable tray will be located on each side of the corridor, except where explicitly noted otherwise, as shown on the communications drawings. Bends in the cable tray shall never exceed 90 degrees, and all 90-degree bends must be sweeping bends. All cable tray bends and corners shall be made from one section of tray bent and formed per manufacturer instructions, or shall be factory formed fittings from the same manufacturer as the cable tray. Cable tray must be completely accessible from at least one side in addition to the minimum overhead clearance. All cable trays must be bonded and grounded. Conduits, raceways, and cable trays must be suspended from or attached to the structural ceiling or walls with hardware or other installation aids specifically designed to support their weight. Cable tray may be attached to the structural ceiling only when crossing corridors, all other instances must be approved in advance by HCDE IT. HCDE IT uses only firestop pillows to fireproof cable tray openings and will be specified and provided by HCDE IT.
3. Each room with fire rated walls will require one or more fireproof opening(s) above ceiling to provide access into corridor. The opening(s) should be located 6 to 8 inches above the cable tray. These openings shall be located above the doorways in all locations. HCDE IT is requesting that the General Contractor and/or the electrical contractor install a Specified Technologies, Inc. EZ-Path device that includes all required fireproof materials to allow for compliant communications cable installation. Flanges supplied with the EZ-Path product must be installed. The number of openings and EZ-Path devices will be determined by the number of cables being utilized in each particular room and will be designated on the drawings. All flanges and parts supplied with the EZ-Path devices must be installed or the EZ-Path will be deemed unusable by HCDE IT and shall be replaced at the contractor's expense. Any or all EZ-Path devices located within 12 inches of AC ducting and/or piping of any trade will be considered unusable by HCT and shall be replaced at the contractor's expense.
4. The General Contractor and/or the electrical subcontractor will be responsible for field coordination to allow the proper installation and routing of the cable tray.

B. Cable Distribution Between Closets

1. Homerun conduits will be utilized for cable distribution between the main telecom closet and all intermediate telecom closets.
2. The General Contractor and/or the electrical subcontractor will be responsible for field coordination to allow the proper installation and routing of conduits and the required junction boxes.
3. All underground FIBER conduits shall require to have a tracer wire installed with, including any of those from the utility(ies).
4. All homerun conduit runs should have a junction box after every 100', except those designated for CATV distribution cable, which will require a junction box after every 60' (Does not apply with fiber video distribution). Junction boxes should be sized in accordance with current BICSI Telecommunications Distribution Methods Manual. Minimum pull box size for one (1) 2" conduit each in opposite ends of the box is 8" wide and 36" long and 4" deep. Width increase for additional conduit is 5" per conduit. (*Reference TDMM, 13th Edition 5-65*). Contact the Hamilton County Telecommunications Manager for assistance.
5. All homerun conduit runs should achieve the best direct route (preferably parallel to building lines) with no bend greater than 90 degrees or aggregate of bends in excess of 180 degrees between pull boxes. Any and all 45-degree bends and doglegs must be approved in advance by HCDE IT. Condulets are not allowed under any circumstances. All bends must be sweeping, long radius type. The bend radius for 2" conduit must be at least 6 times the internal conduit size. (*Reference TDMM, 13th Edition 5-65*).
6. All homerun conduit runs must be run overhead unless specifically approved by the Hamilton County Telecommunications Manager prior to being run under the foundation.
7. All homerun conduit runs must be clearly marked on each end to designate the locations connected. A measured pull cord that has a minimum test rating of 200 lbs. and bushings must be provided and installed by the electrical contractor. All conduits must be bonded to ground per NEC or local requirements. All conduit grounds must be clearly labeled and shown on all as-builts.
8. GC will be required to install four (4) 2" conduits from the main Telecom closet to each IDF.

C. Communications Closets

1. All walls shall be covered in 3/4" A/C Grade plywood painted on both surfaces with two (2) coats of white fire-retardant paint, securely fastened with C Grade surface facing the supporting wall. (HCDE IT *will not accept* fire retardant plywood a lesser grade of plywood or any color but white in any

Telecommunications room.) Bottom of plywood should be mounted above electrical outlets.

2. The overhead cable tray(s) shall be routed into the closet as specified on drawings.
3. All home run conduits shall be routed into the closet(s) as shown on drawings.
4. A minimum of three (3) dedicated electrical circuits and two (2) convenience outlets will be required for each telecom closet. Receptacles shall be located as shown on drawings. At least one receptacle should be connected to emergency power if available.
5. The minimum size for all IDF Telecommunications Closet shall be 6 ft. wide by 9 ft. deep.
This size is for closets serving an area of 5,000 sq. ft. or less. The minimum size for MDT Telecommunications Closet shall be 10 ft. wide by 12 ft. deep. The majority of the Telecommunications Closets will need to be larger. The size to be determined by the area served. (*Reference TDMM, 11th Edition 6-15*).
6. "Telecommunications Closets in multi-floor buildings should be aligned vertically. All telecommunications spaces should be built on one or more load Bearing walls. All telecommunications spaces should be located in areas dedicated to telecommunications use. Equipment not related to the support of telecommunications spaces (e.g., piping, duct work, and distribution of building power) shall not be located in, or pass through the telecommunications space." (*Reference TDMM, 13th Edition 3-12*) This also includes ship ladders, stairwells, pipe chases or egress of any type.
7. Telecommunications space may not be shared with building or custodial services. (*Reference TDMM, 13th Edition 3-12*).
8. Doorways in Telecommunications Closets must be a minimum of 3 feet wide and 6.6 feet high. Double doors should be provided for main Telecommunications Closets providing an opening 6 feet wide and 7.5 feet high. All doors must open out. (*Reference TDMM, 13th Edition 3-7*).
9. All Telecommunications closets must have a continuous and dedicated environmental control (24/7/365). If available, the HVAC system serving Telecommunications closets should be connected to emergency power. A positive pressure with a minimum of one air change per hour must be maintained in all Telecommunications spaces. The temperature range in all Telecommunications closets should be between 64 to 75 degrees Fahrenheit. A temperature above 75 degrees is detrimental to the electronics and is unacceptable to HCDE IT. At all times the humidity range should be 30% to 55% relative humidity. (*Reference TDMM, 13th Edition 3-9*).

D. Work Area Outlets

1. All communications Work Area Outlets (WAO) will consist of a 4" x 4" and

- 2 ¼" dual gang box with a single gang adapter ring (mud ring) and one (1) 1-¼" conduit stubbed above ceiling unless otherwise noted. Conduit must be turned into room, not into corridor. Boxes should be located within 12" of the matching electrical outlet and located 18" AFF as specified by the architect, unless otherwise noted.
2. All Telephone Work Area Outlets (WAO) (indicated on plans as TP for 'teacher's phone') will consist of a 3 x 2 x 1 1/2" Single gang and one (1) 1-1/4" conduit stubbed above ceiling unless otherwise noted. Conduit must be turned into room, not into corridor. Boxes should be located 48" AFF as specified by the architect, unless otherwise noted. This location will be located at what is created as the lockdown area of a classroom. I.e., away from windows and doors. Generally, the inside hall wall opposite the door.
 3. Communications outlets designated for CATV will consist of 2 each 4" X 4" X 2 ¼ " dual gang box with a single gang adapter ring (mud-ring), and with one 1 ¼" conduit stubbed above ceiling for communication and the other with ¾" C to connect for power. A duplex receptacle shall be installed within 12" of the designated CATV outlet. Boxes shall be 88" AFF or at height directed by Architect.
 4. All conduit stubs for WAO including callbacks and CATV must include bushings and pull strings.
 5. Flexible conduit (metal flex) is not recommended for use in any communications application. Any use of flexible conduit must have prior approval from HCS IT, and if used must be sized one trade size larger than the equivalent rigid conduit. Daisy chaining of communications outlets is not acceptable.
- E. Clocks shall be supplied by HCDE.
1. All POE CLOCK Outlets will consist of a 3 x 2 x 1 1/2" Single gang box with a single gang adapter ring (mud ring) and one (1) 1-1/4" conduit stubbed above ceiling unless otherwise noted. Conduit must be turned into room, not into corridor. Box must be located 96" AFF at the location show on the print.
 2. Dual face clocks in hallways will need a single gang box at 96 A.F.F. These will be marked on the maps for exact locations. IF the ceiling height in the hallway will not allow for a clearance for the top of the clock, this will need to be lowered. Can confirm with HCS IT dept for exact height.
- F. Wireless Equipment and SIP Speaker
1. Various locations in the gathering areas as well as all classrooms and teacher workrooms, as well as various other designated will be equipped for a wireless data network and SIP Paging. Typically, the location will be on the corridor wall 8" below finished ceiling (BFC). Wireless outlets will consist of a 4 x 4 x 2 ¼ dual gang box with a single gang adapter ring and one (1) 1- ¼" conduit stubbed above ceiling. Contractor is responsible for coordinating exact location with the Hamilton County Telecommunications Manager.

2.2 SUBMITTAL DATA:

- A. Provide submittal data for the following:
 - 1. Overhead Cable Management Equipment
 - 2. EZ-Path and accessories
- B. Submittals shall include manufacturer's published capacity information, including tables, curves and other data required to determine capabilities under design conditions. Also included shall be shop drawings and wiring diagrams.
- C. Submittal catalog sheets shall be properly marked in red to indicate what the Contractor is proposing for installation on the project
- D. Any deviations from the contract plans and specifications shall be noted by the Contractor on his submittal. Although these specifications are by no means exhaustive, they do represent some of the more common discrepancies in design considerations. Any deviations from the above requirements must be approved in writing by the Hamilton County Department of Education IT prior to installation. All deviations made without prior written approval will be rejected by Hamilton County Department of Education IT and must be corrected at the contractor's expense
- E. The Architect's approval of shop drawings, diagrams, schedules, etc., shall not relieve the Contractor from responsibility for deviations from drawings or specifications unless he has, in writing, called the Architect's attention to such deviations at the time of submission nor shall it relieve him from responsibility for errors of any sort in shop drawings or schedules.
- F. Four (4) copies shall be submitted to the Architect.

2.3 REJECTION OF MATERIAL:

- A. The Architect shall have the authority to reject any material, equipment, or workmanship not complying with the Contract Documents. The Contractor shall replace defective work or materials immediately upon notification of rejection.

PART 3 – EXECUTION:

3.1 ROLE OF THE SUPERINTENDENT:

- A. The Division 27 Superintendent's duties shall include, but not be limited to the following:
 - 1. Planning and layout of the work.
 - 2. Coordination with other trades and the local utility companies.

3. Posting addenda and changes in the work to maintain the Record Drawings and to ensure that Division 27 personnel are working from up-to-date drawings and specifications.
4. Supervision of all Division 27 personnel.
5. Ongoing review of work in place to ensure compliance with Contract Documents.
6. Administrative duties as required fulfilling the requirements of the General Conditions, special Conditions and Division 01/02 specifications.

3.2 PROTECTION OF THE WORK:

- A. Protect the work during the course of construction. Do not install any equipment or materials until the proper environmental conditions have been established.
 1. Store materials in the manner recommended by the manufacturer until materials are installed.
 2. Install temporary protective covers over equipment enclosures, outlet boxes and similar items after interiors, conductors, devices, etc. are installed to prevent the entry of construction debris and to protect the installation during finish work performed by others.
 3. Clean all equipment, inside and out, upon completion of the work. Scratched or marred surfaces shall be touched-up with touch-up paint.
- B. Replace all equipment and materials that become damaged.

3.3 COORDINATION AND LAYOUT:

- A. The work called for under this section shall be carried on simultaneously with the work of other trades in such a manner as not to delay the overall progress of the work.
- B. Locate all sleeves and inserts as required before the floors and walls are built. All drilling required for the installation of sleeves shall be done under Division 26.
- C. Before any piping, cable tray, raceway, ductwork, outlets, equipment or lighting fixtures are located in any area coordinate the space requirements of Division 27 trades. Such shall be arranged so that space conditions will allow all trades to install their work and will also permit access for future maintenance and repair.

3.4 WORKMANSHIP:

- A. The work under this Section shall be performed by skilled and qualified technicians with complete knowledge of the National Electrical Code. The NFPA 70 establishes minimum standards for electrical installations. These drawings and specifications in many instances exceed the minimum requirements of NFPA 70 and the work shall be performed accordingly.

- B. Detailed descriptions of all tasks are not provided by these drawings and specifications. It is imperative that workers have thorough knowledge of proper electrical installations.
- C. Work shall be subject to constant inspection and final approval by the Architect. Any inspections or approvals shall not relieve the contractor of responsibility for compliance with any and all requirements of the Contract Documents.
- D. Good workmanship shall be evidenced in the installation of all electrical materials and equipment. Equipment shall be level, plumb and true with the structure and other equipment; also, in a horizontal or vertical position as intended. All materials shall be firmly secured in place and adequately supported and permanent. Materials embedded in concrete or masonry or otherwise part of the structure is considered sufficiently supported. All hardware and accessory fittings shall be of a type designed, intended and appropriate for the use and complement the items with which they are used.
- E. All materials and equipment including any hangers, supports, fastenings or accessory fittings shall have corrosion protection suitable for the atmosphere in which they are installed whether located indoors or outdoors. Care shall be taken during the installation to assure the integrity of corrosion protection. Protect all field cuts and damage to corrosive resisting coatings with cold galvanizing paint.
- F. All screws, bolts, nuts, clamps, fittings or other fastening devices shall be made up tight. All bolts, screws, nuts and other threaded devices shall have standard threads and heads so they may be installed and replaced when necessary without special tools.

3.5 EQUIPMENT MOUNTING:

- A. Equipment may be ceiling hung, wall mounted or floor mounted as appropriate. The fasteners or supports shall be sufficient to substantially secure the equipment in place to the building structure or structural element. In addition to the weight of the equipment consideration shall be given to the type of load. The supports may be catalog items or job fabricated, and shall be appropriate for the location and compatible with the equipment.
- B. Fasteners and supports shall have corrosion protection suitable for the atmosphere. Selection of the fasteners and supports shall be based upon the strength of the materials and recognized safety factors.
- C. The equipment shall be installed plumb, true as intended and secure. All of these factors shall be immediately apparent.

- D. When several items of equipment are wall mounted in the same area care shall be taken to line them up vertically and horizontally. Raceways to and from the equipment shall be vertical and horizontal using appropriate fittings at auxiliary gutters where necessary and practical for appearance.
- E. Raceways or cable extending from ceiling or overhead systems to floor mounted equipment shall be additionally supported. When the equipment is mounted on a foundation and the raceway is in the floor, the raceway shall be stubbed up within the foundation. Raceway connections to equipment subject to vibration shall be terminated in a junction box and final connections made with flexible conduit. The junction box shall be located as close as practical to the equipment terminals.

3.6 MOUNTING HEIGHTS:

- A. The mounting heights and location of wall switches, controls, fire alarm, security, video and other devices and equipment are defined elsewhere.
- B. Consideration must be given to the practical installation problem, neatness and good workmanship. For example, fire bridging, furring strips or the like may not permit the installation of devices at the heights listed here. Wainscoting may also cause variation. It is not considered good workmanship to have a finish plate span different types of building finishes.
- C. The safety and convenience of the user is of prime consideration in the location and mounting height of devices and equipment. Intercom stations or devices, which require hand operations such as switches, shall be located so that they can easily be reached by the average person without having to stretch or stoop or to use ladders or stools. Handicap codes must be complied with.
- D. Convenience as well as appearance and good workmanship calls for consistency in the mounting height and location of similar devices and equipment. Special use or special purpose outlets shall be located conveniently for the purpose intended.

3.7 FINAL TESTS AND INSPECTION:

- A. Upon completion of the work and prior to request for final inspection, test the individual systems.
- B. Provide all instruments, labor and materials required by the Engineer for any essential and intermediate and final tests designated.
- C. Tests shall indicate full compliance with specifications, drawings and applicable codes. The Architect shall be notified prior to these tests so that he may observe them.

- D. Furnish the Architect three (3) sets of test reports indicating tests performed and the results.

3.8 WARRANTY:

- A. Provide a one (1) year warranty, minimum, on all parts and labor for all equipment and labor provided under Division 27. The warranty time period shall start on the date of Owner acceptance and/or date of Certificate of Substantial Completion.

3.9 MAINTENANCE DATA:

- A. Furnish and deliver at final inspection complete copies of all data prepared by manufacturers detailing operation and maintenance instructions on all equipment requiring adjustments or maintenance.

3.10 ITEMS TO BE TURNED OVER TO OWNER:

- A. The following items shall be turned over to the Owner at the time final inspection is held:
 1. Certificates of inspection and approval from authorities having jurisdiction.
 2. Furnish a written guarantee stating that, if any workmanship or material executed under this section proves defective within one year after final acceptance, such defects and all other work damaged thereby shall be made good by him without charge.
 3. Contractor shall provide "as built" blue prints. The actual locations of all conduit systems, outlets and equipment installed by the Contractor shall be indicated so as to enable the Owner to properly operate, maintain and repair both exposed and concealed work.
 4. One complete set of approved, corrected shop drawings.
 5. Furnish two (2) complete copies of all data prepared by manufacturers, detailing operation and maintenance instructions on all equipment requiring maintenance.

END OF SECTION

SECTION 27 53 10

ELECTRONIC SCOREBOARD

PART 1 – GENERAL:

1.1 WORK DESCRIPTION:

- A. Provide all labor, equipment, materials, etc. required to complete installation as specified herein and/or shown or scheduled on the drawings.
- B. Provide power for scoreboards located as shown on drawings. There will be scoreboards for the main gym.

PART 2 – PRODUCTS:

2.1 ELECTRICAL EQUIPMENT:

- A. Provide polarized power plugs.
- B. Provide multi-pin plug and receptacle combination units for use with control cable.

2.2 OPERATOR'S CONTROL STATION:

- A. Provide power for the operator's control station at each scoreboard location. For the main gymnasium, provide flexible cord/conduit to allow the use of jacks mounted in the riser or the motor-operated bleachers. See details on the drawings.
- B. Provide multi-pin receptacles for wall box mounting and necessary PVC plastic insulated multi-conductor control cable to connect the control points as shown with the scoreboards.

PART 3 – EXECUTION:

- 3.1 Coordinate with scoreboard manufacturer's representative to ensure that it is installed properly and operating in complete accordance with the manufacturer's intended performance.

END OF SECTION

SECTION 28 31 00

FIRE ALARM SYSTEMS

PART 1 – GENERAL:

1.1 SUMMARY: This Section covers fire alarm equipment, including initiating devices, notification appliances, controls, supervisory devices, training, warranty and certification.

- A. Work required under this section includes all work necessary for the installation of fire alarm components as specified herein and scheduled. The components are to be furnished by the contractor as part of the contract – see plans and bid sheets for details.
- B. Contractor's bid shall include all equipment, labor, shipping, taxes, programming and testing necessary to provide a fully functional fire alarm system ready to be monitored by the owner's monitoring agency.
- C. The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and NICET certified technicians, and shall maintain a service organization within 100 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signaling systems industry.

1.2 GUARANTEE AND WARRANTY:

- A. Warranty Period: Each piece of equipment is warranted against any and all defects in material and workmanship, and shall meet performance specifications after one (1) year from the date of Certificate of Occupancy. This warranty period covers repairs and/or replacement of defective parts. Contractor to warrant wiring and installation for one (1) year from date of Certificate of Occupancy.

1.3 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.
- B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications.
- C. The system and all associated operations shall be in accordance with the latest editions of the following:

1. NFPA 72, National Fire Alarm Code
2. NFPA 70, National Electrical Code
3. NFPA 101, Life Safety
4. International Building & Electrical Codes
5. Local Jurisdictional Adopted Codes and Standards
6. ADA Accessibility Guidelines

1.4 SYSTEM DESCRIPTION:

- A. General - Provide a complete, non-coded, addressable, microprocessor-based fire alarm system with addressable initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein. The control panel shall be an intelligent addressable panel with addresses as required for all devices required & shown plus 20% future expansion.
- B. History Logs - The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.
- C. Recording of Events - Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence.
- D. Wiring/Signal Transmission
 1. Transmission shall be addressable signal transmission, dedicated to fire alarm service only.
 2. System connections for initiating (signaling) circuits and notification appliance circuits shall be Class B.
 3. Unless otherwise specifically noted, all fire alarm cables are to be in conduit or other approved raceway. Any cables allowed to be outside of raceway are to be riser- and plenum-rated, with red jacket.
- E. Required Functions - The following are required system functions and operating features:
 1. Transmission to Remote Central Station - Automatically route alarm, supervisory, and trouble signals to owner's remote central station service transmitter provided under another contract.
 2. Annunciation - Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the location and type of device.

3. General Alarm - A system general alarm shall include:
 - a. Indication of alarm condition at the FACP and the annunciator(s).
 - b. Identification of the device & location that is the source of the alarm at the FACP and the annunciator(s).
 - c. Operation of audible and visual notification devices throughout the building until silenced at FACP.
 - d. Closing doors normally held open by magnetic door holders.
 - e. Unlocking designated doors.
 - f. Shutting down supply and return fans serving zone where alarm is initiated (or all supply and return fans where noted or required by local AHJs.)
 - g. Notifying the local fire department via transmission to owner's monitoring agency.
4. Supervisory Operations - Upon activation of a supervisory device such as low air pressure switch, or tamper switch, the system shall operate as follows:
 - a. Activate the system supervisory service audible signal and illuminate the LED at the control unit and the graphic annunciator.
 - b. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
 - c. Record the event in the FACP historical log.
 - d. Transmission of supervisory signal to remote central station.
5. Drill - A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.
6. WALKTEST - The system shall have the capacity of 8 programmable pass code protected one person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:
 - a. Control relay functions associated to one of the 8 testing groups shall be bypassed.
 - b. The control unit shall indicate a trouble condition.
 - c. The alarm activation of any initiation device in the testing group shall cause the audible notification appliances to sound a voice announcement to identify the device.
 - d. The unit shall automatically reset itself after signaling is complete.

F. Analog Smoke Sensors

1. Monitoring - FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
2. Environmental Compensation - The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically

compensate for dust, dirt, and other conditions that could affect detection operations within the range allowed by applicable codes.

3. Programmable Sensitivity - Photoelectric Smoke Sensors shall have 7 sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP, or an equal approved method of adjusting sensitivity.
 4. Sensitivity Testing Reports - The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements
 5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to indicate that a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting shall be provided.
 6. The FACP shall continuously perform an automatic self-test on each sensor, which will check sensor electronics and ensure the accuracy of the values being transmitted.
- G. Fire Suppression Monitoring
1. Water flow - Activation of a water flow switch shall initiate general alarm operations.
 2. Sprinkler valve tamper switch - The activation of any valve tamper switch shall activate system supervisory operations.
- H. Audible Alarm Notification - By voice evacuation and/or tone signals on loudspeakers in areas as indicated on drawings.
1. Automatic Voice Evacuation Sequence (where applicable)
 - a. The audio alarm signal shall consist of an alarm tone for a maximum of five seconds followed by an automatic digital voice message. At the end of the voice message, the alarm tone shall resume. This sequence shall sound continuously until the "Alarm Silence" switch is activated.
 - b. All audio operations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component rewiring or hardware additions.
- I. Manual Voice Paging
1. The system shall be configured to allow voice paging.
 2. The control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.
 3. Facility for total building paging shall be accomplished by the means of an "All Call" switch.
- J. Power Requirements
1. The control unit shall receive power via a dedicated circuit.
 2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal power in a normal supervisory mode for a period of 24 hours with 5 minutes of alarm at the end of this

period, longer where required by applicable codes or AHJ. The system shall automatically transfer to battery standby upon power failure.

3. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be indicated at the control unit.
4. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.5 SUBMITTALS:

- A. General - Submit the following according to Conditions of Contract and Division 1 Specification Sections.
 1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification. After system approval, submit drawings on building floor plan showing all devices, wiring routing, splice and pull box locations, termination details, and cable types.

1.6 QUALITY ASSURANCE:

- A. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

1.7 EMERGENCY FORCES NOTIFICATION:

- A. Where required by the NFPA, emergency forces notification shall be provided to alert the municipal fire department fire brigade (if provided) of fire or other emergency.
- B. Where fire department notification is required by another section of this Code, the fire alarm system shall be arranged to transmit the alarm automatically via any of the following means acceptable to the authority having jurisdiction and shall be in accordance with NFPA 72, National Fire Alarm Code:
 1. Auxiliary alarm system
 2. Central station connection
 3. Proprietary system
 4. Remote station connection

PART 2 – PRODUCTS:

2.1 FIRE ALARM CONTROL PANEL (FACP):

- A. General - Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."
- B. The following FACP hardware shall be provided:
 - 1. Minimum 200 Addressable point capacity (inputs or outputs).
 - 2. Minimum 200 points of annunciation where one (1) point of annunciation equals:
 - a. LED or 1 switch on a LED/switch module.
 - b. 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
 - 3. The FACP shall support up to three (3) RS-232-C ports.
 - 4. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators, transponders, and I/O panels.
 - 5. Point Reporting Digital Alarm Communications Transmitter (DACT).
- C. Alphanumeric Display and System Controls - Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.
- D. Voice Alarm – If so noted on the drawings, provide an emergency communication system, integral with the FACP, including voice alarm system components, microphones, amplifiers, and tone generators.
- E. Distributed Module Operation - FACP shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel:
 - 1. Amplifiers, voice and telephone control circuits
 - 2. Addressable Signaling Line Circuits
 - 3. Initiating Device Circuits
 - 4. Notification Appliance Circuits
 - 5. Auxiliary Control Circuits
 - 6. Graphic Annunciator LED/Switch Control Modules

2.2 ADDRESSABLE MANUAL PULL STATIONS:

- A. Description - Addressable Single-action type, red LEXAN or metal, and finished in red with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key.

- B. All manual pull stations shall be fitted with a battery-powered anti-tamper device similar to the STI Mini-Stopper II, which covers the station and, if actuated, initiates a local alarm. This device is used to decrease the incidents of false alarms.

2.3 SMOKE SENSORS:

- A. General - Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
 - 1. Self-Restoring - Detectors do not require resetting or readjustment after actuation to restore normal operation.
 - 2. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor, but shall indicate a "Wrong Device" trouble condition.
 - 3. Addressability - Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
- B. Type - Smoke sensors shall be of the photoelectric type. Where acceptable per manufacturer specifications, ionization type sensors may be used.
- C. Duct Smoke Sensor - Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.
 - 1. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable.
 - 2. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
 - 3. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
 - 4. Duct Housing shall provide a magnetic test area and Red sensor status LED.
 - 5. Each duct sensor shall have a Remote Test Station with an alarm LED and test switch.

2.4 HEAT SENSORS:

- A. Thermal Sensor - Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.
- B. Sensor fixed temperature sensing shall be programmable to operate at 135-deg F or 155-deg F.
- C. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

2.5 STANDARD ALARM-NOTIFICATION APPLIANCES:

- A. Visible/Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. All visual devices shall be equipped with switches to allow adjustment of the candela output of the strobe.
- B. Audible/Visible: Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. All audible (horn/strobe) devices shall be equipped with switches to allow adjustment of the dB output of the horn.
- C. Speaker - Speaker notification appliances shall be listed to UL 1480.
 - 1. The speaker shall operate on a standard 25VRMS or 70.7VRMS NAC using twisted/shielded wire.
 - 2. The following taps shall be available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet.
 - 3. The speaker installs directly to a 4" square, 1 1/2 in. deep electrical box with 1 1/2" extension.

2.6 MAGNETIC DOOR HOLDERS:

- A. Description - Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate. Unit shall operate from a 24VDC source, and develops a minimum of 25 lbs. holding force.

2.7 REMOTE DISPLAYS AND PRINTERS:

- A. Fire Alarm Control Unit shall be capable of operating remote displays and/or printers; output shall be ASCII from an RS-232-C connection with an adjustable baud rate.
- B. Each RS-232-C port shall be capable of supporting and supervising a remote Printer; the FACP shall support as many as two (2) remote CRT displays or four (4) printers. The Fire Alarm Control Panel shall support up to five (5) RS-232-C ports.

2.8 REMOTE LCD ANNUNCIATOR:

- A. Provide a Remote LCD Annunciator with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LED's and LCD Display and the FACP.
- B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LED's.
- C. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

2.9 SYSTEM PRINTER:

- A. General - Provide a printer, listed and labeled as an integral part of the fire alarm system.

2.10 WIRING:

- A. The following types of wire is required for each type of device:

| | |
|---------------------|------------------|
| Addressable Devices | WP980 18/2 |
| Speaker Cir. | WP975 18/2 TW/Sh |
| Strobe & Horn Cir. | WP994 14/2 |
| Door Holders | WP994 14/2 |
| Annunciator | WP982 18/4 |

- B. Wiring part numbers refer to West Penn. Only West Penn or equivalent Belden wire is acceptable. Note that cable requirements may vary with the system model and manufacturer.

PART 3 - EXECUTION:

3.1 INSTALLATION, GENERAL:

- A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.
- B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
 - 1. Factory trained and certified personnel.
 - 2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
 - 3. Personnel licensed or certified by state or local authority.

3.2 EQUIPMENT INSTALLATION:

- A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

3.3 WIRING INSTALLATION:

- A. System Wiring - Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AH) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
- B. All fire alarm system conductors shall be in conduit (sized by supplier, but minimum $\frac{3}{4}$ " EMT) or other approved raceway unless specifically noted otherwise on the drawings. There shall be no couplings below ten feet above floor. Fittings shall be compression type or forged or cast steel; no die cast fittings are acceptable.
- C. Paint box covers red and label or paint conduit every ten feet to identify fire alarm system.

3.4 FIELD QUALITY CONTROL:

- A. Manufacturer's Field Services - Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

- B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
 - 1. Factory trained and certified.
 - 2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
 - 3. International Municipal Signal Association (IMSA) fire alarm certified.
 - 4. Certified by a state or local authority.
 - 5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.

- C. Minimum System Tests - Test the system according to the procedures outlined in NFPA 72.

3.5 TRAINING:

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel. Minimum training time shall be 4 hours.
- 3.6 The Date of Substantial Completion shall be certified, by the Engineer, as that date on which the installation of the equipment has been satisfactorily completed in accordance with the Contract Documents.
- 3.7 The equipment supplier shall turn over, to the successful Electrical Contractor, all documentation of the three (3) year warranty, and any additional warranty documentation as required by these specifications.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Protecting existing trees to remain.
 - 2. Removing existing trees, shrubs, groundcovers, plants, and grass.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above- and below-grade site improvements.
 - 6. Disconnecting, capping or sealing, and abandoning site utilities in place or removing site utilities.
 - 7. Temporary erosion and sedimentation control measures.
- B. Related Sections include the following:
 - 1. Division 31 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
 - 2. Division 32 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and planting.

1.03 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.
- B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.04 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.05 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings according to Division 1 Section "Contract Closeout."
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.06 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.07 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect improvements on adjoining properties and on Owner's property.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners.
- C. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.
- D. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- E. Notify utility locator service for area where Project is located before site clearing.
- F. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

1.08 EXISTING SERVICES

- A. General: Indicated locations are approximate; determine exact locations before commencing Work.
- B. Arrange and pay for disconnecting, removing capping and plugging utility services. Notify affected utility companies in advance, minimum forty-eight hours, and obtain written approval before starting work.
- C. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earthwork."
 - 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 TEMPORARY SEDIMENT AND EROSION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.03 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
 - 1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 - 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with wet burlap to prevent roots from drying out.
 - 2. Temporary support and protect roots from damage until they are permanently relocated and covered with soil
 - 3. Coat cut faces of roots more than 1-1/2 inches in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Backfill with soil as soon as possible.
- D. Maintain fenced area free of weeds and trash.
- E. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
 - 1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
 - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.04 UTILITIES

- A. Contractor shall arrange for disconnecting and sealing utilities that serve existing structures before site clearing and demolishing begins.
 - 1. Coordinate schedule with Owner.
 - 2. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange to shut off indicated utilities with utility companies. Pay any required fees.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Architect's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.

3.05 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
 4. Use only hand methods for grubbing within drip line of remaining trees.
 5. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.06 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
 2. Do not stockpile topsoil within drip line of remaining trees.
 3. Dispose of excess topsoil as specified for waste material disposal.
 4. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.07 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
 2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.08 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

- B. Burning on Owner's Property: Burning may be permitted only at designated areas and times as directed by the Owner and by local and state issuing authorities. A burn permit as well as any other associated permit(s) must be obtained by the contractor by the local issuing authority. The contractor shall comply with all local codes. Provide full time monitoring personal for burning materials until fires are extinguished.

END OF SECTION

SECTION 31 20 00

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Report of Geotechnical Exploration, "Proposed Multi-Purpose Building", Chattanooga, Tennessee, GEOServices Project Number 41-23132, dated February, 21, 2023.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for concrete walks and pavements.
 - 5. Base course for asphalt paving.
 - 6. Subsurface drainage backfill for walls and trenches.
 - 7. Excavating and backfilling trenches within building lines.
 - 8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
 - 1. Division 32 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and plantings.

1.03 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Layer placed between the subbase course and asphalt paving.
- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.
- J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- K. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- L. Rock Excavation
 - 1. Sound, solid rock in its original position in ledges, bedded deposits, or masses of such hardness and texture that, in the opinion of the Engineer, cannot be loosened or broken down and removed by use of heavy construction equipment such as power shovels, bulldozers, heavy-duty rooters, etc., without drilling and blasting, or with an air-hammer shall be classified as rock excavation.
 - 2. Boulders, stones, or pieces of masonry that are one-half cubic yard or larger in volume shall be considered rock excavation.
 - 3. Hard pan, small boulders less than one-half cubic yard in volume, chert, clay, soft shale, soft and disintegrated rock, and similar material shall not be considered as rock even though the Contractor elects to excavate same by drilling and blasting, or with an air hammer.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Separation fabric.
- B. Photographs of existing adjacent structures and site improvements
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.05 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.
- B. Geotechnical Testing Agency Qualifications: The Geotechnical testing agency will be hired by the Contractor. The Contractor shall coordinate testing requirements with the testing agency and provide access to the site.

1.06 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Contact utility-locator service for area where Project is located before excavating.

- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- C. The contractor shall refer to the geotechnical report for requirements regarding undercutting and importation of approved fill. The contractor shall include undercutting, offsite waste, importation and compaction of approved fill in the base bid as outlined in the geotechnical report.
- D. Architect's Earthwork and Site Grading Design, and this Specification Section 31 20 00 are intended to comply with recommendations of the Geotechnical Engineer as found in the Geotechnical Report mentioned in 1.01 Related Documents, part B.
 - 1. Contractor shall read the Geotechnical Report.
 - 2. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
 - 3. Additional test borings and other exploratory operations may be performed by the Contractor, at Contractor's option. However, no change in Contract Sum will be authorized for such additional exploration.
- E. Contractor shall comply with the Architect's Specifications and Drawings, but they shall notify the Architect prior to performing any Work in question if they perceive conflicts between the Architect's Specifications and the recommendations found in the Geotechnical Report. The Architect will resolve the questions.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Imported fill soils should consist of low to moderately plastic clay or silt with a plastic index of less than thirty-five ($PI < 35$) and a standard Proctor maximum dry density greater than 90 pounds per cubic feet. The imported fill should contain no rock fragments larger than 6 inches in any dimension, and should be free from organic matter and other deleterious matter. The on-site soils may be used as engineered fill as approved acceptable by the Owner's Geotechnical testing agency. Existing fill soils will require evaluation by the Owner's Geotechnical testing agency to determine if they can be used as structural fill.
- C. Unsatisfactory Soils: The Geotechnical testing agency observation will determine unsatisfactory soils.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1- inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-

inch sieve and 0 to 5 percent passing a No. 8 sieve.

- J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Communication, Alarm or Signal Lines, Cables or Conduit.
 - 4. Blue: Potable Water systems.
 - 5. Green: Sewer and Drain systems.
 - 6. Purple: Reclaimed Water, Irrigation and Slurry Lines, Fire Protection or other Non-potable Water lines.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Strip all topsoil, vegetation, and any debris from the construction area and either waste it from the site or use as topsoil or fill in areas to be landscaped. The stripped area should extend at least 10 feet beyond exterior foundation excavations and at least 5 feet beyond the outside edge of paved areas.

3.02 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.03 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.04 STABILITY OF EXCAVATIONS

- A. Comply with all Federal, State and local codes, ordinances and requirements of authorities having jurisdiction to maintain stable excavations.

3.05 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - 2. Any reference to rock on the plans or specifications is not to be construed as classification of excavation.
- B. Excavation shall be where indicated on the drawings and to the grades indicated.

3.06 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.
- B. Rock encountered in the process of excavation for structures shall be uncovered and stripped of all loose materials over the entire limits of excavation. Rock encountered for removal in a trench section shall be uncovered for a distance of not less than fifty feet (50'). In both cases, the Engineer shall be notified immediately so that the surface can be examined and the necessary measurements and elevations taken.
- C. Rock under structures shall be excavated to lines and grades shown on the Drawings. Except as hereinafter provided otherwise where rock excavation has been carried below grade, the Contractor shall backfill to grade with Class B concrete at his/her own expense.

Where rock foundation is obtained at grade for over 50 percent of the area of any one structure, the portion of the foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock. The portion below grade shall be backfilled with Class B concrete.

Where rock foundation is obtained at grade for less than 50 percent of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, the rock shall be removed for a depth of 12 inches below grade, and the space below grade shall be backfilled with crushed stone as specified above for pipe lines.
- D. Rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer shall be completed before construction of any structure is started in the vicinity.

3.07 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.08 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
 1. Clearance: 12 inches on each side of pipe or conduit.
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

| Size of Pipe Line, Inches | Depth of Excavation Below Bottom of Pipe, Inches | |
|------------------------------|--|------------|
| | Sewer Pipe | Water Pipe |
| 4 to 12 incl. | 6 | 6 |
| 15 to 33 incl. | 8 | 8 |
| 36 and over | 12 | 12 |

The space below grade for pipe sewers shall then be backfilled with 3/8 inch crushed rock or gravel or other approved material and tamped to the proper grade. Where pipe sewers are constructed on concrete cradles rock shall be excavated to the bottom of the cradle as shown on the Plans.

- E. Rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer shall be completed before construction of any structure is started in the vicinity.

3.09 APPROVAL OF SUBGRADE

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect or Soils Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.
- E. Avoid over compaction and smearing of subgrade below infiltrations areas such as pervious pavement and bio-retention. Rake or rip subgrade as necessary to remove any smearing of subgrade.

3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.
- B. Where width of trench exceeds industry standard width, provide stronger pipe or special installation procedures, as required by the Architect at no cost to the Owner.

3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for record documents.
 3. Inspecting and testing underground utilities.
 2. Removing concrete formwork.
 3. Removing trash and debris.
 4. Removing temporary shoring and bracing and sheeting.
 5. Installing permanent or temporary horizontal bracing on horizontally supported walls

3.13 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. In areas where trench is under paved areas, backfill remainder of trench with Bedding or Engineered fills to subgrade.
- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.
- D. Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of public roadways, or 24 inches below surface of parking lots or driveways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- E. Place and compact initial backfill of satisfactory soil or subbase material, free of particles larger than 1 inch, to 12 inches over pipe or conduit.
- F. Where sewers, water lines, etc. are to be installed within the street right-of-way, they shall be backfilled full depth with stone per local code. The trenches under the building and at least 5 feet beyond the building limits shall be backfilled with low plasticity and low permeability soils per the geotechnical reports. If sewer is located in fill and backfill is six feet or over from the top of pipe to finished subgrade, backfill in accordance with paragraph above.
 1. Carefully compact material under pipe haunch and backfill evenly on both sides and along pipe or conduit to avoid damage or displacement of system.
- G. Fill voids with approved backfill materials as shoring and bracing and sheeting is removed.
- H. Place and compact final backfill of satisfactory soil material to final subgrade.
- I. Coordinate backfilling with utilities testing.
- J. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.14 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills. Areas receiving fill shall be proof rolled in the presence of a Geotechnical Engineer prior to fill placement. Areas identified as unacceptable by the Geotechnical Engineer shall be excavated (undercut) and

backfilled prior to fill placement.

1. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. When subgrade or existing ground to receive fill has density less than required for fill, break up surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.
- C. Place and compact fill material in layers to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.
 2. Under walks and pavements, use subbase or base material, or satisfactory soil material.
 3. Under steps and ramps, use engineered fill.
 2. Under building slabs, use drainage fill over subgrade and engineered fill to bring to subgrade.
 5. Under footings and foundations, use engineered fill.
- D. Compact rock in accordance with the Geotechnical Engineer's recommendations

3.15 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 3 percent of optimum moisture content.
1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
1. Under structures, building slabs and steps, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material at 100 percent standard Proctor compaction.
 2. Under pavements, scarify and recompact top 24 inches of existing subgrade and each layer of backfill or fill material at 100 percent standard Proctor compaction.
 3. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 95 percent standard Proctor compaction.
 4. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent standard Proctor compaction.

3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 2. Walks: Plus or minus 1/2 inch.
 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 SUBSURFACE DRAINAGE

- A. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.
1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches.
1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.

3.19 SUBBASE AND BASE COURSES

- A. Under pavements and walks, place subbase course on prepared subgrade and as follows:
1. Place base course material over subbase.
 2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry density according to ASTM D 698.
 3. Shape subbase and base to required crown elevations and cross-slope grades.
 4. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
 5. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.20 DRAINAGE COURSE

- A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
1. Compact drainage course to required cross sections and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.
 2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
 3. When compacted thickness of drainage course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.21 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a Geotechnical engineering firm to perform field quality assurance testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 - 2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on visual comparison of each subgrade with related test strata when acceptable to the Geotechnical Engineer.
 - 3. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
 - 4. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.22 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 31 31 16
TERMITE CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This Section includes the following for termite control:
 - 1. Soil Treatment

1.03 DEFINITIONS

- A. EPA: Environmental Protection Agency.
- B. PCO: Pest Control Operator.

1.04 SUBMITTALS

- A. Product Data: Treatments and application instructions including EPA-Registered Label.
- B. Product Certificates signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
- C. Qualification Data: For firm and persons specified in "Quality Assurance: Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Soil Treatment Application Report: After application of termiticide is completed, submit report for owner's record information, including the following as applicable:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.
- E. Warranties: Special warranties specified in this section.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.
- B. Regulatory Requirements: formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

- B. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are complete, except as otherwise required in construction operations.

1.07 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.08 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity of damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
- C. Warranty Period: Five years from date of Substantial Completion.
- D. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.09 MAINTENANCE SERVICE

- A. Continuing Service: Provide a proposal for continuing service, including monitoring, inspection, and retreatment for occurrences of termite activity, from applicator to Owner, in the form of a standard yearly (or other period) continuing service agreement, starting on the date of Substantial Completion. State services, obligations, conditions and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quality required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.
- B. 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. AgrEvo Environmental Health, Inc.: A company of Hoechst and Schering, Berlin.
 - 2. American Cyanamid Co.: Agricultural Products Group, Specialty Products Department.
 - 3. Bayer Corp.: Garden & Professional Care.
 - 4. DowElanco
 - 5. FMC Corp.: Pest Control Specialties.
 - 6. Zeneca Professional Products.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with

requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.
- C. Fit filling hose connected to water sources at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.03 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.04 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
 - 1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - 3. Masonry: Treat voids
 - 4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- C. Protect Termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instruction.
- D. Post warning signs in areas of application.
- E. Re-apply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application

END OF SECTION

SECTION 31 50 00

EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

- 1.01** Performance Requirements: Design, provide, monitor, and maintain an anchored and braced excavation support and protection system capable of resisting soil and hydrostatic pressure and supporting sidewalls of excavations.
- A. System design and calculations must be acceptable to authorities having jurisdiction.
- 1.02** Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted in writing by the Architect and then only after arranging to provide temporary utility services according to requirements indicated.
- 1.03** Project Site Information: A geotechnical report has been prepared for this Project and is available for information only. The report is not part of the Contract Documents. Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
- A. Make additional test borings and conduct other exploratory operations as necessary.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

- 3.01** Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
- 3.02** Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
- 3.03** Locate excavation support and protection systems clear of permanent construction and to permit forming and finishing of concrete surfaces.
- 3.04** Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure excavation support and protection systems remain stable.
- 3.05** Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.
- 3.06** Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures as determined by a registered soils engineer. Remove in stages to avoid disturbing underlying soils and damaging structures, pavements, facilities, and utilities.
- A. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.

END OF SECTION

SECTION 32 11 00
SUB-GRADE AND BASE COURSE PREPARATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Sub-grade preparation.
- B. Crushed stone or crushed gravel compacted base course.

1.02 RELATED WORK

- A. Section 32 13 13 – Portland Cement Concrete Paving
- B. Section 32 12 16 – Hot Mix Asphalt Paving

1.03 REFERENCES

- A. Where Tennessee Department of Transportation Specifications for road and Bridge construction are referred to, the applicable requirements of that Section shall be considered a part of these specifications and all materials and construction methods prescribed therein shall be as binding as if herein specified. The Sections referred to are from Tennessee, current edition with latest supplements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Base Courses: Comply with Tennessee Department of Transportation specifications, Section 303, Class A.

PART 3 - EXECUTION

3.01 SUB-GRADE PREPARATION

- A. Grade sub-grade to lines and grades indicated. Preparation of sub-grade shall be in compliance with Tennessee D.O.T. Specifications sections referenced herein.

3.02 BASE COURSE

- A. Construct crushed stone or crushed gravel base course to thickness indicated on drawings and in compliance with Tennessee D.O.T. Specifications, Section 303, Class A.
- B. All areas to receive paving shall be graded to the indicated sub-grade elevation and proof-rolled as outlined below.
- C. All areas (sub-grade) to receive compacted fill, pavements or slabs on grade shall be proof-rolled in the presence of the Owner's Representative or Testing Agency to detect any soft areas that may exist. A four-wheeled, pneumatic-tired roller of not less than 25 tons, or its equivalent, shall be used for this operation. At least four passes shall be made, two in each of two directions at right angles. Any soft areas thus disclosed shall be stabilized or undercut and replaced with properly compacted material as approved by the Owner's Representative or Testing Agency.
- D. Proof-rolling should be conducted only on soils in their approximate natural moisture condition. Proof-rolling should not be undertaken after rains while soils are still in a high moisture condition (well above the natural moisture content) or on soils which are desiccated by prolonged drying.

END OF SECTION

SECTION 32 12 16
HOT MIX ASPHALT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Hot-mix asphalt paving.
 - 2. Hot-mix asphalt patching.
 - 3. Hot-mix asphalt overlays.
 - 4. Pavement-marking paint.
 - 5. Wheel Stops
- B. Related Sections include the following:
 - 1. Section 32 13 73 – Pavement Joint Sealants
 - 2. Section 31 20 00 – Earthwork
 - 3. Section 32 11 00 – Subgrade and Base Course Preparation

1.03 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.
 - 1. Standard Specification: As indicated.

1.04 SUBMITTALS

- A. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
 - 1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which Project is located.

- C. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.
- D. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Slurry Coat: Comply with weather limitations of ASTM D 3910.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.01 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel complying with ASTM D 692.
- C. Fine Aggregate: Sharp-edged natural sands or sand prepared from stone, gravel, or combinations thereof complying with ASTM D 1073.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

2.02 ASPHALT MATERIALS

- A. Asphalt Cement: ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.
- B. Asphalt Cement: ASTM D 3381 for viscosity-graded material.
- C. Under-sealing Asphalt: ASTM D 3141, pumping consistency.

2.03 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- C. Paving Geotextile: Non-woven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

- D. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M-248, Type N.
- E. Pavement-Marking Paint: Latex, water-base emulsion, ready-mixed, complying with FS TT-P-1952.
 - 1. Color: As indicated.
- F. Wheel Stops: Pre-cast, air-entrained concrete, 4000-psi minimum compressive strength, approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside, and provide holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, diameter 3/4 inch, minimum length 10 inches.

2.04 MIXES

- A. Provide mixes compiling with typical specifications of Tennessee Department of Transportation.

Surface Course: Surface course shall conform to Tennessee Department of Transportation standard specifications, Section 411, Asphalt Concrete Surface (Hot Mix) with aggregates meeting requirements of subsection 903.11, Grading E used as surface for traffic lanes (50-55% crushed limestone and 45-50% natural sand, sand slag, or sand manufactured from gravel.
- B. Asphalt Binder Course: Binder course shall conform to TDOT Standard Specification Sections 3307-B, 307-BM, or 307-C.
- C. The base shall be a dense graded mineral aggregate base, compacted to 95 percent of the Standard Proctor maximum dry density. The base shall meet the requirements conforming to all Tennessee Department of Transportation specification 303, class A. The base shall be placed in a way that prevents segregation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that sub-grade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll sub-base using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.02 COLD MILLING

- A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and, as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.
 - 1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

3.03 PATCHING AND REPAIRS

- A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Re-compact new sub-grade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
 - 1. Tack coat faces of excavation and allow to cure before paving.
 - 2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
 - 3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer

finished flush with adjacent surfaces.

- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Pump hot under-sealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseal pieces firmly.
 - 2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.
- C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch. Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.
- E. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.
 - 1. Allow tack coat to cure undisturbed before paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.04 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared sub-grade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.
 - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- C. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared sub-grade or surface of compacted-aggregate base before applying paving materials.
 - 1. Mix herbicide with prime coat when formulated by manufacturer for that purpose.

3.05 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.
 - 1. Place Binder.
 - 2. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 - 3. Spread mix at minimum temperature of 250 deg F.

4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 5. Regulate paving machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide, except where fill-in edge strips of a lesser width are required.
1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.06 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
1. Clean contact surfaces and apply tack coat.
 2. Offset longitudinal joints in successive courses a minimum of 6 inches.
 3. Offset transverse joints in successive courses a minimum of 24 inches.
 4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.07 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and re-rolling to required elevations.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
 2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping while surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials.

Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.08 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch.
 - 2. Surface Course: 1/8 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.09 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to cure for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturers recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb./gal.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
 - 1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
 - 2. Reference maximum theoretical density will be determined by averaging results from

- 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
3. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
 - F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION

SECTION 32 13 13
PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Concrete sidewalks, roads, aprons, door pads, curbs and gutters.
- B. Reinforcement.
- C. Surface finish.
- D. Curing.

1.02 RELATED WORK

- A. Section 32 11 00 - Sub-grade and Base Course Preparation
- B. Section 32 13 73 - Pavement Joint Sealants
- C. Section 31 20 00 – Earthwork

1.03 REFERENCES

- A. ACI 211.1 - Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete.
- B. ACI 211.2 - Recommended practice for Selecting Proportions for Structural Lightweight Concrete.
- C. ACI 301 - Specifications for Structural Concrete for Buildings.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
- E. ACI 305R - Hot Weather Concreting.
- F. ACI 306R - Cold Weather Concreting.
- G. ACI 315 - Details and Detailing of Concrete Reinforcement.
- H. ACI 318 - Building Code Requirements for Reinforced Concrete.
- I. ACI 347 - Recommended Practice for Concrete Formwork, Concrete Reinforcing Steel Institute, Manual of Standard Practice.
- J. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- K. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- L. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
- M. ASTM C31 - Standard Method of Making and Curing Concrete Test Specimens in the Field.
- N. ASTM C33 - Standard Specification for Concrete Aggregates.
- O. ASTM C39 - Standard Test Method of Compressive Strength of Cylindrical Concrete Specimens.
- P. ASTM C78 - Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
- Q. ASTM C94 - Ready Mixed Concrete.
- R. ASTM C143 - Slump of Portland Cement Concrete.
- S. ASTM C150 - Portland Cement.
- T. ASTM C172 - Sampling Fresh Concrete.

- U. ASTM C173 - Air Content of Freshly Mixed Concrete by the Volumetric Method.
- V. ASTM C192 - Making and Curing Concrete Test Specimens in the Laboratory.
- W. ASTM C231 - Air Content Of Freshly Mixed Concrete by the Pressure Method.
- X. ASTM C260 - Air-Entraining Admixtures for Concrete.
- Y. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- Z. ASTM C494 - Chemical Admixtures for Concrete.
- AA. ASTM C1116 - Standard Specification for Fiber-Reinforced
- BB. ASTM D8139 - Semi-rigid, Closed Cell, polypropylene form, preformed joint fillers for Concrete Paving and Structural Construction.
- CC. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- DD. Tennessee Department of Transportation - Standard Specifications for Road and Bridge Construction.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain materials from same source throughout.
- C. Submit laboratory test reports for concrete materials and mix design test as specified.
- D. Provide material certificates in lieu of materials laboratory test reports when permitted by Owner's Representative. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item meets specified requirements.
- E. Use of Synthetic Fibers shall be approved by the owner or architect.

1.05 TESTS

- A. As the work progresses, sample concrete in accordance with ASTM C172.
- B. Make slump tests according to ASTM C143, one slump test for each set of test cylinders.
- C. Test air content of concrete made with normal-weight aggregates having low water absorption according to either ASTM C231 or ASTM C173. For lightweight aggregates or aggregates with high absorptions, use latter test method.
- D. Make compression test specimens and cure according to ASTM C31. Each test shall consist of one set of laboratory cured cylinders. A set shall consist of four cylinders. Minimum number of tests shall be one for 100 cubic yards of concrete for each class. Make at least one test per day of each class of concrete used that day.
- E. Cure specimens under laboratory conditions. Specimens cured under job conditions may be required when, in Owner's Representative's opinion, there is a possibility of the surrounding air temperature falling below 40°F, or rising above 90°F.
- F. Test cylinders according to ASTM C39.
- G. Test laboratory cured cylinders one at seven days, two at 28 days, and one at 56 days, if required.
- H. Strength level of concrete will be considered satisfactory if averages of any three consecutive strength test results of laboratory cured cylinders equal or exceed specified strength f'_c , and no individual strength test result falls below specified strength f'_c by more than 500 psi.
- I. Make reports on cylinder tests to Owner's Representative and show dates placed and tested, name of job, proportions of cement and aggregate, quantity of water, slump, air

content, admixtures, location of concrete in the project, type of concrete, compressive strength in pounds per square inch and atmospheric and concrete temperature at time of sampling.

- J. In cases where strength of laboratory cured cylinders shown by tests for any portion of paving falls below required compressive strengths specified, Owner's Representative shall have the right to order change in mix or in cement content for remaining portion of the paving.
- K. Make and cure flexural test beam specimens according to ASTM C78. Each test shall consist of one set of laboratory cured beams. A set shall consist of two beams. Minimum number of tests shall be one for each 100 cubic yards of concrete placed, at least one per day. Cure specimens under laboratory conditions.
- L. Test beams according to ASTM C78, simple beam with third-point loading. Test beams shall have six inches by six-inch cross-section.
- M. Test beams at 14 days.
- N. Flexural strength level of concrete shall be considered satisfactory as long as averages of any three consecutive test results of laboratory cured beams equal or exceed specified strength, and no individual strength test result falls below specified strength by more than 100 psi.
- O. Concrete cylinder and flexural tests shall be made by an independent testing laboratory selected by Owner. Cost of initial tests shall be paid for by Owner. Subsequent tests required as a result of improper strength shall be paid for by Contractor.

PART 2 - MATERIALS

2.01 CONCRETE MATERIALS

- A. Cement: ASTM C150, Normal-Type I, gray color.
- B. Fine and Coarse Aggregates: ASTM C33. Provide aggregates from single source for exposed concrete.
 - 1. For grading tests of fine and coarse aggregates, use square mesh wire cloth complying with ASTM E11.
 - 2. Fine Aggregate:
 - a. Provide washed natural sand of strong, hard durable particles.
 - b. Grade from coarse to fine within following limits:

| Sieve Size | Percentage by Weight Passing Sieve | |
|------------|------------------------------------|---------|
| | Minimum | Maximum |
| 3/8" | 100 | -- |
| No. 4 | 95 | 100 |
| No. 8 | 65 | 95 |
| No. 16 | 45 | 75 |
| No. 30 | 30 | 50 |
| No. 50 | 10 | 22 |
| No. 100 | 2 | 8 |

- 3. Coarse Aggregate:
 - a. Provide coarse aggregate consisting of clean, hard, fine-grained, sound crushed rock or washed gravel, or combination of both.
 - b. Any piece having length in excess of five times average thickness shall be considered flat or elongated.

- c. The maximum size coarse aggregate shall 1½" with the minimum size being 1 inch.
- d. Grade combined aggregates within following limits:

| Sieve Size or Percentage by Weight Passing Sieve | | | | |
|--|---------------|-----|--------------|-----|
| Size in Inches | 1½" Aggregate | | 1" Aggregate | |
| | Min | Max | Min | Max |
| 1½" | 95 | -- | -- | -- |
| 1" | 75 | 90 | 90 | 100 |
| ¾" | 55 | 77 | 70 | 90 |
| ⅜" | 40 | 55 | 45 | 65 |
| No. 4 | 30 | 0 | 31 | 7 |
| No. 8 | 22 | 35 | 23 | 40 |
| No. 16 | 16 | 30 | 17 | 35 |
| No. 30 | 0 | 20 | 10 | 23 |
| No. 50 | 2 | 8 | 2 | 10 |
| No. 100 | 0 | 3 | 0 | 3 |

- e. Water: Clean, not detrimental to concrete, and conforming to ACI 318, Article 3.4.
- f. Form Materials.
 - 1) Conform to ACI 301.

C. Reinforcement

1. Reinforcing Steel: ASTM A615; 60 ksi yield grade; deformed billet steel bars.
2. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.
3. Tie Wire: Annealed steel, minimum 16 gauge size.
4. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finish.
5. Synthetic fiber reinforcement: manufactured in ISO 9001:2000 certified facility.
6. Minimum 10-year satisfactory performance history of specified synthetic fiber reinforcement.

D. Accessories

1. Curing Compound: FS TT-C-800, Type 1, 30% solids; ASTM C309, Kurey DR, manufactured by Euclid Chemical Company and L&M Cure Resin by L&M Construction Materials, or approved equal.
2. Expansion Joint Filler: Non-extruding, non-bituminous, resilient type complying with AASHTO M153 and ASTM D8139
3. Joint Sealant for Pavements Unless Noted Otherwise on Drawings: Urethane complying with ASTM D1850 and ASTM C290 such as "Urexpan NR-200" by Pecora Corp., "VULKEM-245" by Mameco International, "THC-900" by Tremco or approved equal.

E. Admixtures

1. Air Entrainment: Conform to ASTM C260.
2. Water Reducing Admixture: Conform to ASTM C494, Type A, containing not more than 1% chloride ions.
3. High Range Water Reducing Admixture (Super Plasticizer): Conform to ASTM C494, Type F or G, containing not more than 1% chloride ions.

4. Non-Chloride Accelerator Admixture: Conform to ASTM C494, Type C or E. Provide long-term test data proving non-corrosive effect on reinforcing steel.
- F. Concrete Mix Design
1. Design concrete for flexural strength of 650 pounds per square inch at 14 days, compressive strength of (f'c) of 3,000 pounds per square inch at 28 days unless otherwise directed on plans.
 2. Concrete shall contain no calcium chloride nor shall admixtures contain more than 1 % chloride ions or air entraining cement, unless approved by Owner's Representative.
 3. Concrete shall be air entrained and conform to air content limits of Table 1 below.

| Table 1 – Air Content for Air-Entrained Concrete | |
|---|----------------------------------|
| Maximum Size Coarse Aggregate Inches | Air Content Percent by Volume |
| 1 | 5.5±1 |
| 1½" | 5.0±1 |

4. Concrete shall have a slump of 3", plus or minus ½".
5. Methods of measuring concrete materials shall be such that proportions can be accurately controlled and easily checked. Measurement of materials for ready-mixed concrete shall conform to ASTM C94.
6. Use accelerating admixtures in cold weather only when approved by Owner's Representative. Use of admixtures will not relax cold weather placement requirements.
7. Use set-retarding admixtures during hot weather only when approved by Owner's Representative.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify compacted subgrade ready to support paving and imposed loads.
- B. Verify correct gradients and elevations of base.
- C. Beginning installation implies acceptance of existing conditions.

3.02 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Notify Owner's Representative minimum 24 hours before start of concreting operations.

3.03 FORMING

- A. Place and secure forms to correct location, dimension, and profile.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT

- A. Where noted on drawings, reinforce concrete paving with welded steel wire fabric.
- B. Provide chairs, supports, spacers, bolsters and other devices to keep reinforcement at proper elevations and in place.
- C. Interrupt reinforcement at control, contraction and expansion joints.

- D. Synthetic Fiber Reinforcement if used shall be added to concrete mixture in accordance with manufacturer's instructions.

3.05 FORMED JOINTS

- A. Place joints as shown on plans to correct elevation and profile.

3.06 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Hot Weather Placement: ACI 305R.
- C. Cold Weather Placement: ACI 306R.
- D. Ensure reinforcements, inserts, embedded parts, formed joints and are not disturbed during concrete placement.
- E. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- F. Place concrete to pattern indicated. Saw cut contraction joints at an optimum time after finishing. Saw joints in accordance with details on plans.
- G. Chamfer exposed corners of concrete using wood, metal, PVC, or rubber chamfer strips fabricated to produce smooth lines and tight edge strips.

3.07 FINISHING

- A. Road and Apron Paving: Light broom.
- B. Sidewalk Paving: Light broom and trowel joint edges.
- C. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.08 FIELD QUALITY CONTROL

- A. Field testing will be performed by an independent testing company as selected by the Owner.
- B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.09 PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

SECTION 32 13 73
PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Expansion and contraction joints within portland cement concrete pavement.
 - 2. Joints between portland cement concrete and asphalt pavement.
- B. Related Sections include the following:
 - 1. Division 32 Section "Portland Cement Concrete Paving" for constructing joints in concrete paving.

1.03 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backer materials have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or

other causes.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
 - 3. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.02 COLD-APPLIED JOINT SEALANTS

- A. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- B. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.
- C. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Type SL Silicone Sealant for Concrete and Asphalt:
 - a. 890-SL; Dow Corning Corp.
 - b. Roadsaver Silicone SL; Crafc0, Inc.
 - c. Sika-1C SL; Sika Corp.
 - d. Or Equivalent
 - 2. Multicomponent Low-Modulus Sealant for Concrete and Asphalt:
 - a. SOF-SEAL; W.R. Meadows, Inc.
 - b. Roadsaver Silicone; Crafc0, Inc.
 - c. 888; Dow Corning Corp.
 - d. Or Equivalent

2.03 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.

- B. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

2.04 PRIMERS

- A. Primers: Product recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint- sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or

curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
 2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint sealant manufacturer's written instructions, unless otherwise indicated.

3.04 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.05 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 32 31 13

PVC COATED CHAIN LINK FENCES, POSTS AND GATES

PART 1 - GENERAL

1.01 SCOPE

- A. Summary: The work covered by this section includes furnishing all labor, materials, and equipment required to install Class 2b Fused and Adhered, Poly Vinyl Chloride (PVC) Coated, Steel Chain Link Fence, including all excavation, concrete, and accessories, as shown on the Drawings or specified herein.
- B. General: Like items of materials provided hereafter shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance and replacement.
- C. Delivery, Storage and Handling: Deliver material to the site in an undamaged condition. Carefully store material off the ground to provide proper protection against oxidation caused by ground moisture.

1.02 SUBMITTALS

- A. Shop Drawings: Include complete details of fence and gate construction, fence height, post spacing, dimensions and unit weights of framework and concrete footing details. Actual samples and certificates of compliance may be requested.
- B. Product Data: Provide manufacturer's catalog cuts with printed specifications. Manufacturer shall provide certification of compliance with material specifications. Actual samples of the material may be requested.

1.03 STANDARDS

- A. ASTM B 6 Slab Zinc
- B. ASTM F567 Installation of Chain Link Fence
- C. ASTM F668 Poly(Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric, Class 2b
- D. Federal Specification RR-F-191K/1D Fencing, Wire and Post Metal (Chain-Link Fence Fabric), Type IV
- E. American Association of State Highway Transportation Officials (AASHTO) M-181 Chain Link Fence, Type IV, Class A
- F. ASTM F1043 Strength and Protective Coating on Metal Industrial Chain Link Fence Framework Group I-A and Group I-C Heavy Industrial
- G. ASTM F934 Standard Colors for Polymer-Coated Chain Link Fence Materials
- H. Federal Specification RR-F-191K/3D Fencing, Wire and Post Metal (Chain-Link Fence Posts, Topsails and Braces), Class 1, Grade A or B
- I. American Association of State Highway Transportation Officials (AASHTO) M-181 Chain Link Fence, Grades 1 and 2

PART 2 - PRODUCTS

2.01 FENCE FABRIC

- A. The base metal of the chain link fence fabric shall be composed of commercial quality, medium-carbon galvanized (zinc coated) steel wire. The vinyl coating shall be thermally bonded to a thermoset-bonding layer over a galvanized steel wire. Vinyl coating thickness, coating weight, and wire tensile strength conform to Federal specification RR-F-191K/1D, ASTM F668, Class 2b and (AASHTO) M-181, Type IV, Class A, as shown in Table 1. The

wire is PVC coated before weaving, is free and flexible at all joints, and is knuckled at both selvages.

Table 1-PVC Coated Steel Wire Characteristics

| Zinc Coated Core Wire Size | | | PVC Coated Finished Wire Size | PVC Coated Wire Allowable Variance | | Core Wire Zinc Coating Weight, Min | | PVC Coating Thickness | | Breaking Strength, minimum | | Tensile Strength, min | |
|----------------------------|-------|------|-------------------------------|------------------------------------|----------|------------------------------------|------------------|-----------------------|--------------|----------------------------|-------|-----------------------|-----|
| ga | inch | mm | ga | Inch | mm | oz/ft ² | g/m ² | Inch | mm | lbf | N | ksi | MPa |
| 9 | 0.148 | 3.76 | 8 | + - 0.005 | + - 0.13 | 0.30 | 92 | 0.006 to 0.010 | 0.15 to 0.25 | 1,290 | 5,740 | 75 | 515 |

- B. Coating: Only plasticized poly(vinyl chloride) (PVC) with a low temperature (-20°C, -4°F) plasticizer and no extenders or extraneous matter other than the necessary stabilizers and pigments, is used. The PVC coating resists attack from prolonged exposure to dilute solutions of most common mineral acids, seawater, and dilute solutions of most salts and alkali. The vinyl coating is thermally bonded to a thermoset-bonding layer over a galvanized steel wire. The wire is PVC coated before weaving and is free and flexible at all joints.
- C. Color: Shall Conform to ASTM F934, Black

2.02 FENCE POSTS AND RAILS

- A. The base metal of the posts and rails shall be commercial steel conforming to ASTM F1043 Group I-A and I-C, Heavy Industrial Fence, and also conform to Federal specification RR-F-191, Class 1, Grades A and B and ASSHTO M181 Grades 1 and 2. The thickness of the PVC coating shall be a minimum 0.010 to 0.015 in.
- B. Coating: Only plasticized poly(vinyl chloride) (PVC) with a low temperature (-20°C, -4°F) plasticizer and no extenders or extraneous matter other than the necessary stabilizers and pigments, is used. The PVC coating resists attack from prolonged exposure to dilute solutions of most common mineral acids, seawater, and dilute solutions of most salts and alkali.

2.03 FITTINGS

- A. Fittings and other accessories shall be zinc-coated (galvanized) pressed steel, cast steel or malleable iron, as specified and are coated with matching PVC by the same process as post and rails. PVC coating thickness shall be a minimum 0.006 mils. Painted fittings are not acceptable.
- B. Color: Shall Conform to ASTM F934, Black

2.04 FENCE MATERIALS

- A. Fabric
 - Fused and Adhered Poly(Vinyl Chloride)-PVC Coated Steel Chain Link Fence Fabric
 - 1. 9 gauge zinc coated core wire with 8 gauge PVC coated finished wire size
 - 2. 2-inch mesh
 - 3. Knuckled at both selvages unless otherwise specified.
- B. Posts: Steel pipe, ASTM F1043, capped
 - 1. Line post: 2-3/8 inch O.D.
 - 2. Corner, end, angle, and pull posts: 2-7/8 inch O.D., Schedule 40

3. Gate posts, 3 and 12 feet wide: 4 inch O.D. Schedule 40
4. Backstop posts: 6.625 inch O.D. min, Schedule 40
- C. Top rail: 1 5/8 inch O.D., with expansion couplings spaced at not less than 10 feet intervals.
- D. Bottom rail: 1 5/8 inch O.D., with expansion couplings spaced at not less than 10 feet intervals.
- E. Fittings: pressed steel, cast steel or heavy malleable iron.

2.05 GATE

- A. Vehicle Type: 12 foot minimum, double swing
- B. Pedestrian Type: 3 foot minimum, single swing
- C. Frames
 1. 2 inch O.D. pipe
 2. Material: Galvanized steel.
 3. Construction: Welded corners or assembled with corner fittings and 3/8-inch steel truss rods.
 4. Provide horizontal 1 1/4 inch brace rail and 3/8-inch truss rod for gates 5 feet wide or greater.
 5. Provide vertical 1 1/4 inch brace rail for gates 6 feet wide or wider, spacing not to exceed 5-foot centers.
- D. Hinges
 1. Standard type.
 2. Size to accommodate gate frame and post.
- E. Latches
 1. Industrial gate latch with drop rod or center stop.
 2. See plan for latches at playgrounds
- F. Keepers
 1. Mechanical keeper for each gate leaf.
 2. Secure free end of gate when in full open position.

2.06 CONCRETE

- A. Posts shall be placed in masonry wall as shown on the details. Concrete shall be a min. 3000 psi.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify that final grading in fence location is complete without irregularities, which would interfere with fence installation.
- B. Measure and lay out complete fence line.
- C. Locate line posts at equal distance spacing, not exceeding 10-foot centers.
- D. Use corner posts at positions where fence changes direction more than 10 degrees.
- E. Contractor to grout entire length of masonry wall to the top of last block after installation of fence posts, fabric, and net poles.

3.02 INSTALLATION

- A. Install Fence, Fence Posts and Gates in accordance with ASTM practice 567.

3.03 ADJUST AND CLEAN

- A. Adjust brace rails for rigid installation.
- B. Tighten hardware, fasteners and accessories.
- C. Level and smooth all disturbed areas.

END OF SECTION

SECTION 32 90 00

LANDSCAPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Lawns.
 - 2. Topsoil and soil amendments.
 - 3. Fertilizers and mulches.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 31 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
 - 2. Division 31 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.
 - 1. Manufacturer's certified analysis for standard products.
- C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.
- D. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 - 1. Analysis of existing surface soil.
 - 2. Analysis of imported topsoil.
- E. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored

at site.

- B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.06 PROJECT CONDITIONS

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.07 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

1.08 LAWN MAINTENANCE

- A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 60 days after date of Substantial Completion.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches (100 mm).
 - 1. Water lawn at the minimum rate of 1 inch (25 mm) per week.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
- E. Post-fertilization: Apply fertilizer to lawn after first mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of lawn area.

PART 2 - PRODUCTS

2.01 GRASS MATERIALS

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
 - 1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on drawings.

2.02 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of

stones 1 inch (25 mm) or larger in any dimension, and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
2. Topsoil Quantity: Provide topsoil to a minimum depth of 4" in all lawn and landscaped areas.

2.03 SOIL AMENDMENTS

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 (2.36 mm) sieve and a minimum 75 percent passing a No. 60 (250 micrometer) sieve.
 1. Provide lime in the form of dolomitic limestone.
- B. Aluminum Sulfate: Commercial grade, unadulterated.
- C. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.
- F. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 1. When site treated, mix with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cu. ft. (cu. m) of loose sawdust or ground bark.
- G. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- H. Herbicides: EPA registered and approved, of type recommended by manufacturer.
- I. Water: Potable.

2.04 FERTILIZER

- A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:
 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.05 MULCHES

- A. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- B. Non-asphalt Emulsion Tackifier: Nontoxic and free of plant growth- or germination-inhibitors.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PLANTING SOIL PREPARATION

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- B. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.
- C. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
 - 1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid-tolerant plants.
 - 2. Apply phosphoric acid fertilizer, other than that constituting a portion of complete fertilizers, directly to subgrade before applying planting soil and tilling.

3.03 LAWN PLANTING PREPARATION

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.
- C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.
 - 1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
- D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:
 - 1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
 - 2. Till surface soil to a depth of at least 6 inches (150 mm). Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
 - 3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.

- F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.04 SEEDING NEW LAWNS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
- B. Sow seed at the following rates:
 - 1. Seeding Rate: 3 to 4 lb. per 1000 sq. ft. (1.5 to 2 kg per 100 sq. m).
- C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes less than 1:6 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre (45 kg per 100 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
- E. Hydroseeding is an acceptable alternative, at Contractor's option.

3.05 RECONDITIONING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.
- B. Remove vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- C. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- D. Till stripped, bare, and compacted areas thoroughly to a depth of 6 inches (150 mm).
- E. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Provide new planting soil as required to fill low spots and meet new finish grades.
- F. Apply seed as required for new lawns.
- G. Water newly planted areas and keep moist until new grass is established.

3.06 CLEANUP AND PROTECTION

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.07 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

3.08 SEED MIXTURES SCHEDULE

- A. Sun and Partial Shade: Provide certified grass-seed blends or mixes, proportioned by weight,

as follows:

| <u>Proportion</u> | <u>Name</u> | <u>Min. Pct. Germ.</u> | <u>Min. Pct. Pure Sd.</u> | <u>Max. Pct. Weed Sd.</u> |
|-------------------|---------------------|--------------------------------|-----------------------------------|-----------------------------------|
| 50 % | Kentucky 31 | 80% | 85% | 0.5% |
| 30 % | Chewings red fescue | 85% | 98% | 0.5% |
| 10 % | Perennial rye grass | 90% | 98% | 0.5% |
| 10 % | Redtop | 85% | 92% | 1% |

END OF SECTION

SECTION 33 10 00
WATER DISTRIBUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Adhere to local utility standard specifications and details.

1.02 SUMMARY

- A. This Section includes piping and specialties for potable-water service outside the building.
- B. This Section does not include tapping of utility company water main.
- C. Related Sections include the following:
 - 1. Division 22.
- D. Utility-furnished products include water meters that will be furnished to site, ready for installation.

1.03 DEFINITIONS

- A. The following are industry abbreviations for plastic and rubber materials:
 - 1. NP: Nylon.
 - 2. PE: Polyethylene.
 - 3. PP: Polypropylene.
 - 4. PTFE: Polytetrafluoroethylene.
 - 5. PVC: Polyvinyl chloride.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:
 - 1. Potable-Water Service: 150 psig.

1.05 SUBMITTALS

- A. Product Data: For the following:
 - 1. Water-meter bars.
 - 2. Backflow preventers.
 - 3. Pipe and fittings.
 - 4. Valves.
 - 5. Yard hydrants.
- B. Shop Drawings: For precast concrete structures. Include frames and covers and drains.
- C. Shop Drawings: For cast-in-place concrete structures. Include frames and covers and drains.
- D. Record Drawings: At Project closeout of installed water-service piping according to Division 1 Section "Contract Closeout."
- E. Test Reports: As specified in "Field Quality Control" Article in Part 3.
- F. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.06 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."
- B. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.
- C. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.
- D. Comply with ASTM F 645, "Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems."
- E. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 - 1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.08 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verifies existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water-service piping may be installed to comply with original design and referenced standards.
- C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this

information.

1.09 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with utility company.
- B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.
- C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Drilling-Machine, Sleeves, and Corporation Stops:
 - a. Ford Meter Box Co., Inc.
 - b. Grinnell Corp, Mueller Company - Water Products Div.
 - c. Lee Brass Co.
 - 2. Bronze Corporation Stops and Valves:
 - a. Ford Meter Box Co., Inc.
 - b. Grinnell Corp.; Mueller Co.; Water Products Div.
 - c. Watts Industries, Inc., James Jones Co.
 - 3. Tapping Sleeves and Valves:
 - a. American Cast Iron Pipe Co.; Waterous Co.
 - b. East Jordan Iron Works, Inc.
 - c. Grinnell Corp.; Mueller Co.; Water Products Div.
 - 4. Gate Valves:
 - a. American Cast Iron Pipe Co.; American Flow Control Div.
 - b. Grinnell Corp.; Grinnell Supply Sales Co.
 - c. Grinnell Corp.; Mueller Co.; Water Products Div.
 - d. Hammond Valve Corp.
 - 5. Relief Valves:
 - a. Bermad, Inc.
 - b. GA Industries, Inc.
 - c. MULTIPLEX Manufacturing Co.
 - 6. Water-Regulating Valves:
 - a. Ames Co., Inc.
 - b. Cla-Val Co.
 - c. Watts Industries, Inc.; Water Products Div.
 - 7. Backflow Preventers:
 - a. Ames Co., Inc.
 - b. Cla-Val Co.
 - c. Watts Industries, Inc - Water Products Div.

8. Keyed Couplings:
 - a. McWane, Inc., Tyler Pipe, Gustin-Bacon Div.
 - b. Victaulic Co. of America.
 - c. DryLink
9. Protective Enclosures:
 - a. Hot Box.
 - b. HydroCowl, Inc.
10. Drains:
 - a. Josam Co.
 - b. Watts Industries, Inc.; Ancon Drain Div.
 - c. Zurn Industries, Inc.; Hydromechanics Div.
11. Sanitary-Type Yard Hydrants:
 - a. Murdock, Inc.
12. Post-Type Yard Hydrants:
 - a. Josam Co.
 - b. Watts Industries, Inc.; Ancon Drain Div.
 - c. Zurn Industries, Inc.; Hydromechanics Div.

2.02 PIPES AND TUBES

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper Tube: ASTM B 88, seamless water tube, annealed temper.
- C. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.
- D. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.
- E. PE Plastic Pipe: ASTM D 2239, of PE compound and with SIDR required for 160-psig minimum pressure rating. Include marking "NSF-pw" according to NSF 14.
- F. PVC Plastic Pipe: PVC, AWWA C900, Class 200, with bell end with gasket and spigot end.

2.03 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper Fittings: ASME B16.22; wrought-copper, solder-joint pressure type.
- C. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300, as required for system operating pressure.
- D. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111.
- E. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron or cast-iron or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to

AWWA C111.

- F. Ductile-Iron, Flanged Fittings: AWWA C110, with cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550. Include gaskets and bolts and nuts.
- G. Cast-Iron Flanged Fittings: ASME B16.1, Class 125, unless otherwise indicated.
- H. Fittings for PE Plastic Pipe: ASTM D 2609, insert type, made of NP, PP, or PVC plastic; with male, serrated ends matching inside of pipe or threaded ends, as required. Include corrosion-resistant bands or crimp rings.
- I. PVC Plastic, Socket Fittings: ASTM D 2466, Schedule 40.
- J. PVC Plastic Fittings: UL 1285 and AWWA C900, Class 200. With bell and spigot or double bell ends. Include elastomeric gasket in each bell.
- K. Ductile-Iron Fittings for PVC Pipe: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type; push-on- or mechanical-joint type. Include dimensions matching PVC pipe, cement-mortar lining and seal coat according to AWWA C104, and rubber compression gaskets according to AWWA C111.

2.04 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Refer to Division 2 Section "Utility Materials" for commonly used joining materials.
- C. Ductile-Iron Piping: The following materials apply:
 - 1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.
 - 2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
 - 3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
 - a. Gaskets: Rubber, flat face, 1/8 inch thick, unless otherwise indicated and full-face or ring type, unless otherwise indicated.
 - b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series.
- E. Solder Filler Metal: ASTM B 32, Alloy Sn95, Alloy Sn94, or Alloy E, with 0.10 percent maximum lead content.
- F. Primers for PVC Piping Solvent-Cement Joints: ASTM F 656.
- G. Solvent Cement for PVC Piping Solvent-Cement Joints: ASTM D 2564.
- H. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: ASTM A 47, malleable iron; or ASTM A 536, ductile iron.
 - 3. Gaskets: Rubber.
 - 4. Bolts and Nuts: AWWA C111.
 - 5. Finish: Enamel paint.
- I. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.05 PIPING SPECIALTIES

- A. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.
 - 1. Description: Combination of copper alloy and ferrous threaded, solder, plain, and weld-neck end types and matching piping system materials.
 - 2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
 - 3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum pressure to suit system pressures.
 - 4. Dielectric Couplings: Galvanized-steel couplings with inert and non-corrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.
 - 5. Dielectric Nipples: Electroplated steel nipples with inert and non-corrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig working pressure at 225 deg F.

2.06 VALVES

- A. Non-rising Stem, Metal-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C500, gray- or ductile-iron body and bonnet; with cast-iron or bronze, double-disc gate, bronze gate rings, bronze stem, and stem nut. Include 200-psig minimum working-pressure design; interior coating according to AWWA C550; and mechanical-joint ends, unless otherwise indicated.
- B. Non-rising Stem, Resilient-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.
- C. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
 - 1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.
- D. Curb Stops: Bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet to match service piping material.
- E. Service Boxes for Curb Stops: Cast-iron box with telescoping top section of length required for depth of bury of valve. Include cover with lettering "WATER," and bottom section with base of size to fit over curb-stop and barrel approximately 3 inches in diameter.
 - 1. Provide steel tee-handle shutoff rod with each service box. Include tee handle with one pointed end, stem of length to operate curb stop, and slotted end fitting curb-stop head.
- F. Service Clamps and Corporation Stops: Complete assembly, including service clamp, corporation stop, and bolts and nuts. Include service clamp and stop compatible with drilling machine.
 - 1. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.
 - 2. Corporation Stops: Bronze body and ground-key plug, with AWWA C800 threaded inlet and outlet matching service-piping material.
 - 3. Manifold: Copper with 2 to 4 inlets as required, with ends matching corporation stops

and outlet matching service piping.

- G. Ball Valves AWWA C507, Class 250. Include interior coating according to AWWA C550.
- H. Butterfly Valves: UL 1091, with 175-psig working-pressure rating.
- I. Check Valves: UL 312, with swing clapper and 175-psig working-pressure rating.

2.07 SPECIALTY VALVES

- A. Air-Release Valve AWWA C512, hydromechanical device to automatically release accumulated air. Include 300-psig working-pressure design.

2.08 WATER METERS

- A. Water meters will be furnished by utility company.

2.09 WATER-METER BOXES

- A. Description: Cast-iron body and cover for disc-type water meter. Include lettering "WATER METER" in cover; and slotted, open-bottom base section of length to fit over service piping.
 - 1. Option: Base section may be cast-iron, PVC plastic, clay or other pipe.

2.10 BACKFLOW PREVENTERS

- A. General: Manufactured backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.
- B. Working Pressure: 150 psig minimum, unless otherwise indicated.
- C. 2-Inch NPS and Smaller: Bronze body with threaded ends.
- D. 2-1/2-Inch NPS and Larger: Bronze, cast-iron, steel, or stainless steel body with flanged ends.
- E. Interior Lining: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.
- F. Interior Components: Corrosion-resistant materials.
- G. Strainer on inlet if strainer is indicated.
- H. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with non-removable and manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
- I. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, with OS&Y gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.
 - 1. Pressure Loss: 12 psig maximum through middle third of flow range.
- J. Antisiphon, Pressure-Type Vacuum Breakers: ASSE 1020, with valves, spring-loaded check valve, and spring-loaded floating disc. Include test cocks and atmospheric vent for continuous-pressure application.
 - 1. Pressure Loss: 5 psig maximum through middle third of flow range.

2.11 YARD HYDRANTS

- A. Yard Hydrants, Post Type: Non-freeze. Include 3/4-inch NPS inlet, integral or field-installed vacuum breaker with outlet complying with ASME B1.20.7, 3/4-11.5NH threads for garden hose. Include bronze casing, cast-iron or cast-aluminum-casing guard, tapped drain port in valve housing, and key operation. Include body length required for installing inlet valve below frost line. Furnish 2 keys for each hydrant.

2.12 ANCHORAGES

- A. Clamps, Straps, and Washers: ASTM A 506, steel.
- B. Rods: ASTM A 575, steel.
- C. Rod Couplings: ASTM A 197, malleable iron.
- D. Bolts: ASTM A 307, steel.
- E. Cast-Iron Washers: ASTM A 126, gray iron.
- F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig.
 - 1. Cement: ASTM C 150, Type I.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.

2.13 IDENTIFICATION

- A. Refer to Division 31 Section "Earthwork" for underground warning tape materials.
- B. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."
- C. Nonmetallic Piping Label: Engraved, plastic-laminate label at least 1 by 3 inches, with caption "CAUTION--THIS STRUCTURE HAS NONMETALLIC WATER-SERVICE PIPING," for installation on main electrical meter panel.

PART 3 - EXECUTION

3.01 EARTHWORK

- A. Refer to Division 31 Section "Earthwork" for excavation, trenching, and backfilling.
- B. Refer to Division 32 Section "Hot-Mix Asphalt Paving" for cutting and patching of existing paving.
- C. Refer to Division 32 Section "Portland Cement Concrete Paving" for cutting and patching of paving.

3.02 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:
- B. Potable Water-Service Piping: Use the following:
 - 1. 3/4- to 2-Inch NPS: Copper tube, Type K; copper fittings; and soldered joints.
 - 2. 3/4- to 2-Inch NPS: Copper tube, Type K; copper fittings; and brazed joint
 - 3. 3/4- to 2-Inch NPS: PE plastic pipe; molded PE plastic fittings; and heat-fusion joints.
 - 4. Option for 2-1/2- to 3-1/2-Inch NPS: 3- or 4-inch NPS; ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
 - 5. 2-1/2- to 3-1/2-Inch NPS: Copper tube, Type K; copper fittings; and brazed joints.

3.03 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Underground Valves, 3-Inch NPS and Larger: AWWA, gate valves, non-rising stem, with valve box.
 - 2. Underground Valves, 4-Inch NPS and Larger: UL/FM, gate valves, non-rising stem,

with indicator post.

3. Pit and Aboveground Installation Valves, 3-Inch NPS and Larger: AWWA, OS&Y gate valves.
4. Pit and Aboveground Installation Valves, 2-1/2-Inch NPS and Larger: UL/FM, OS&Y gate valves.
5. Pit and Aboveground Installation Valves, 2-Inch NPS and Smaller: MSS, non-rising stem gate valves.

3.04 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings 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.
- B. Install piping at indicated slope.
- C. Install components with pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:
 1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
 2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 3. Install dielectric fittings to connect piping of dissimilar metals.

3.05 SERVICE ENTRANCE PIPING

- A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.
 1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water-piping systems when those systems are installed.
- B. Sleeves and mechanical sleeve seals are specified in Section 22 05 17- Sleeves and Sleeve seals for plumbing piping
- C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.06 PIPING INSTALLATION

- A. Water-Main Connection: Arrange for tap in water main, of size and in location indicated, from water utility.
- B. Make connections larger than 2-inch NPS with tapping machine according to the following:
 1. Install tapping sleeve and tapping valve according to manufacturers written instructions.
 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.

3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
 4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
- C. Make connections, 2-inch NPS and smaller, with drilling machine according to the following:
1. Install service clamps and corporation stops in size, quantity, and arrangement required by utility company standards and according to manufacturer's written instructions.
- D. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- E. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
1. Under Driveways: With at least 36 inches cover over top.
 2. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.
- F. Install piping under streets and other obstructions that cannot be disturbed, by tunneling, jacking, or combination of both.

3.07 ANCHORAGE INSTALLATION

- A. Install anchorage for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorage for the following piping systems:
1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.
 2. Gasketed-Joint, PVC Potable-Water Piping: According to AWWA M23.
- B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.08 VALVE INSTALLATION

- A. General Application: Use mechanical-joint-end valves for 3-inch NPS and larger underground installation. Use threaded- and flanged-end valves for installation in pits. Use non-rising stem UL/FM gate valves for installation with indicator posts. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch NPS and smaller installation.
- B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.
- C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.
- D. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's written instructions. Install underground curb stops with head pointed up and with cast-iron curb box.

3.09 WATER-METER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company's written requirements.
- B. Water Meter: Install displacement-type water meters, 2-inch NPS and smaller, in meter boxes with shutoff valve on water-meter inlet. Include valve on water-meter outlet and valved bypass around meter, unless prohibited by authorities having jurisdiction.
- C. Water Meter: Install compound-type water meters, 3-inch NPS and larger, in meter pits. Include shutoff valves on water-meter inlet and outlet and valved bypass around meter. Support meters, valves, and piping on brick or concrete piers.

3.10 ROUGHING-IN FOR WATER METERS

- A. Rough-in piping and specialties for water-meter installation according to utility company's written instructions and requirements.

3.11 YARD HYDRANT INSTALLATION

- A. Install post-type yard hydrants in pavement or with concrete anchor, and provide for drainage into dry well as indicated.

3.12 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back filling of trench for underground water-service piping. Locate 6 to 8 inches below finished grade, directly over piping.
- B. Attach nonmetallic piping label permanently to main electrical meter panel.

3.13 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.
- C. Prepare reports for testing activities.

3.14 CLEANING

- A. Clean and disinfect water distribution piping as follows:
 - 1. Purge new water distribution piping and parts of existing piping that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. After allowed standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports for purging and disinfecting activities.

END OF SECTION

SECTION 33 30 00
SANITARY SEWERAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Adhere to the City of Chattanooga Department of Public Works Engineering Division "Sanitary Sewer System Design & Construction Manual", WPC 04 0978, latest edition.
- C. Adhere to the City of Chattanooga and Hamilton County Design and Construction Standards, latest edition.

1.02 SUMMARY

- A. This Section includes sanitary sewerage outside the building.

1.03 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. DIP: Ductile Iron Pipe

1.04 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Non-pressure Piping Pressure Ratings: At least equal to system test pressure.

1.05 SUBMITTALS

- A. Product Data: For the following:
 - 1. Backwater valves and clean-outs.
 - 2. Piping Specifications
- B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Pre-cast concrete manholes, including frames and covers.
 - 2. Cast-in-place concrete manholes and other structures, including frames and covers.
- C. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precasts concrete manholes and other structures according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

- A. Site Information: Perform site surveys, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.

- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without owner's written permission.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Gray-Iron Backwater Valves and Clean-outs:
 - a. Josam Co.
 - b. Smith: Jay R. Smith Mfg. Co.
 - c. Zurn Industries, Inc. - Hydromechanics Div.
 - 2. PVC Backwater Valves and Clean-outs:
 - a. IPS Corp.
 - b. NDS, Inc.
 - c. Plastic Oddities, Inc.

2.02 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.03 PIPES AND FITTINGS

- A. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: ASTM A 74, gray iron, for gasketed joints.
 - 1. Gaskets: ASTM C 564, rubber, compression type, and thickness to match class of pipe.
- B. Hubless Cast-Iron Soil Pipe and Fittings: CISPI 301 or ASTM A 888, gray iron, for coupling joints.
 - 1. Cast-Iron, Heavy-Duty Couplings: ASTM C 1277, assembly with housing of gray iron complying with ASTM A 48, stainless-steel bolts, and rubber sealing gasket complying with ASTM C 564.
- C. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.
 - 1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
 - 2. Gaskets: AWWA C111, rubber.
 - 3. Coatings: Shall be per Section 2.07 below.
- D. PVC Sewer Pipe and Fittings: According to the following:
 - 1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.
 - 2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.
- E. PVC Profile Gravity Sewer Pipe and Fittings: ASTM F 794, open and closed profile, bell and spigot for gasketed joints.

1. Gaskets: ASTM F 477, elastomeric seals.

2.04 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for non-pressure joints.
 1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
 2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
 3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
 4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
 5. Bands: Stainless steel at least one at each pipe insert.
- B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for non-pressure joints.
 1. Material for Concrete Pipe: ASTM C 443, rubber.
 2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
 3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
 4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.

2.05 MANHOLES

- A. Normal-Traffic Pre-cast Concrete Manholes: ASTM C 478, pre-cast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
 1. Diameter: 48 inches minimum, unless otherwise indicated.
 2. Ballast: Increase thickness of pre-cast concrete sections or add concrete to base section, as required to prevent flotation.
 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 4. Riser Sections: 4-inch minimum thickness and lengths to provide depth indicated.
 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 6. Gaskets: ASTM C 443, rubber.
 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness that matches 24-inch-diameter frame and cover.
 8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Heavy-Traffic Pre-cast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
 1. Ballast: Increase thickness of one or more pre-cast concrete sections or add concrete to structure, as required to prevent flotation.
 2. Gaskets: Rubber.
 3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total

thickness that matches 24-inch-diameter frame and cover.

4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness that matches 24-inch-diameter frame and cover.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
- D. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "SANITARY SEWER" cast into cover.

2.06 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000-psi minimum, with 0.45 maximum water-cementitious materials ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000-psi minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.
1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 1 percent through manhole.
 2. Benches: Concrete, sloped to drain into channel.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000-psi minimum, with 0.58 maximum water-cementitious materials ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.07 PROTECTIVE COATINGS

- A. Description: One- or two-coat, coal tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:
 - 1. Concrete Manholes: On exterior surface.
 - 2. Ductile Iron Pipe: Shall have Ceramic Epoxy Lining per ASTM A716/A746 or Cement lining per AWWA C104/A21.4

2.08 CLEANOUTS

- A. Gray-Iron Clean-outs: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, and gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
 - 1. Light Duty: In earth or grass foot-traffic areas.
 - 2. Medium Duty: In paved foot-traffic areas.
 - 3. Heavy Duty: In vehicle-traffic service areas.
 - 4. Extra-Heavy Duty: In roads.
 - 5. Sewer PipeFitting and Riser to Clean out: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- B. PVC Clean outs: PVC body with PVC threaded plug. Include PVC sewer pipefitting and riser to clean out of same material as sewer piping.

PART3 - EXECUTION

3.01 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.02 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.03 PIPING APPLICATIONS

- A. General: Include watertight joints.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow Piping: Use the following:
 - 1. NPS 3: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. NPS 3: Hubless cast-iron soil pipe and fittings, couplings, and coupled joints.
 - 3. NPS 3: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.
 - 4. NPS 4 to NPS 6: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 5. NPS 4 to NPS 6: Hubless cast-iron soil pipe and fittings, couplings, and coupled joints.

6. NPS 4 and NPS 6: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints.
7. NPS 4 and NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
8. NPS 4 to NPS 8: Ductile-iron sewer pipe; standard- or compact-pattern, ductile-iron fittings; gaskets; and gasketed joints.

3.04 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
 1. Use the following pipe couplings for non-pressure applications:
 - a. Sleeve type to join piping, of same size, or with small difference in OD.
 - b. Increaser/reducer-pattern sleeve type to join piping of different sizes.
 - c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.
- B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.05 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
 1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
 2. Install piping with 36-inch minimum cover.
- F. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
- G. Install ductile-iron, force-main piping according to AWWA C600.

3.06 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.
- C. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber gaskets according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook." Use gaskets that match class of pipe and

fittings.

- D. Hubless Cast-Iron Soil Pipe and Fittings: With CISPI-type couplings according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
- E. Hubless Cast-Iron Soil Pipe and Fittings: With heavy-duty-type couplings according to CISPI 310, CISPI's "Cast Iron Soil Pipe and Fittings Handbook," and coupling manufacturer's written instructions.
- F. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.
- G. ABS Pipe and Fittings: As follows:
 - 1. Install according to ASTM D 2321.
- H. PE Pipe and Fittings: As follows:
 - 1. Join pipe, tubing, and gasketed fittings with gaskets for watertight joints according to ASTM D 2321 and manufacturer's written instructions.
 - 2. Install according to ASTM D 2321 and manufacturer's written instructions.
 - 3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
- I. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.
- J. PVC Sewer Pipe and Fittings: As follows:
 - 1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
 - 2. Join profile sewer pipe fittings with gaskets according to ASTM D 2321 and manufacturer's written instructions.
 - 3. Install according to ASTM D 2321.
- K. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
 - 1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.
- L. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- M. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.
- N. Install with top surfaces of components, except piping, flush with finished surface.

3.07 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Form continuous concrete channels and benches between inlets and outlet.
- C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.
- D. Install pre-cast concrete manhole sections with gaskets according to ASTM C 891.
- E. Construct cast-in-place manholes as indicated.
- F. Install fiberglass manholes according to manufacturer's written instructions.

3.08 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.09 CLEANOUT INSTALLATION

- A. Install clean outs and riser extension from sewer pipe to clean out at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for clean outs and cast-iron soil pipe for riser extensions to clean outs. Install piping so clean outs open in direction of flow in sewer pipe.
- B. Set clean out frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set clean out frames and covers in concrete pavement with tops flush with pavement surface.

3.10 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.
- B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
- C. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
- D. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - 1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
 - 2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
- E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.11 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Structures: Excavate around structure as required and use one procedure below:
 - 1. Remove structure and close open ends of remaining piping.
Backfill to grade according to Division 31 Section "Earthwork."

3.12 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. Place plug in end of incomplete piping at end of day and when work stops.
 2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
1. Submit separate reports for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Re-inspect and repeat procedure until results are satisfactory.
- C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate reports for each test.
 5. If authorities having jurisdiction do not have published procedures, perform tests as follows:
 - a. Sanitary Sewerage: Perform hydrostatic test.
 - 1) Allowable leakage is a maximum of 50 gal. per inch of nominal pipe size per mile of pipe, during 24-hour period.
 - 2) Close openings in system and fill with water.
 - 3) Purge air and refill with water.
 - 4) Disconnect water supply.
 - 5) Test and inspect joints for leaks.
 - 6) Option: Test ductile-iron piping according to AWWA C600, Section "Hydrostatic Testing." Use test pressure of at least 10 psig.
 6. Manholes: Perform hydraulic test according to ASTM C 969.
 7. Leaks and loss in test pressure constitute defects that must be repaired.
 8. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 33 40 00
STORM DRAINAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Adhere to the City of Chattanooga and Hamilton County Design and Construction Standards, latest edition.

1.02 SUMMARY

- A. This Section includes storm drainage outside the building.

1.03 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. PE or HDPE: Polyethylene plastic, or High Density Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.
- E. CMP: Corrugated Metal Pipe
- F. RCP: Reinforced Concrete Pipe

1.04 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.05 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Precast concrete manholes and other structures, including frames, covers, and grates.
 - 2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates.
- B. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.07 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without owner's written permission.

PART 2 - PRODUCTS

2.02 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.03 PIPES AND FITTINGS

- A. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.
 1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
 2. Gaskets: AWWA C111, rubber.
- B. Ductile-Iron Culvert Pipe: ASTM A 716, for push-on joints.
 1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
 2. Gaskets: AWWA C111, rubber.
- C. Aluminized Steel Type 2 Pipe: AASHTO M274 or ASTM A929.
 1. Fittings: Fabricated to types indicated and according to same standards as pipe.
 2. Connecting Bands: Coupling bands shall be made of the same base metal and coatings as the pipe to a minimum of 18 gage.
 3. Connecting fasteners will be provided by manufacture.
 4. Pipe shall have Manning "n" value of 0.009
- D. HDPE Pipe and Fittings: ASTM F 405, ASTM F 667, AASHTO M 252, and AASHTO M 294.
 1. Soiltight Couplings: ASTM F 405, ASTM F 667, AASHTO M 252, and AASHTO M 294, corrugated, matching pipe and fittings to form soiltight joints.
- E. PVC Sewer Pipe and Fittings: According to the following:
 1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.
 2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.
 3. Perforated PVC Subdrain Pipe: ASTM D1785, Schedule 40.
 - a. Hole Pattern: ASTM F-758/ ASSHTO M278, Hole Size 3/8", Hole Spacing 3" $\pm 1/4$ "
- F. HDPE Sewer Pipe and Fittings: Shall be Double Wall, according to the following:
 1. HDPE Sewer Pipe and Fittings, NPS 4 through NPS 60: ASTM F 2648, for solvent-cemented or gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.
 - b. Fittings: ASTM F 2306, bell and spigot connections shall utilize a push-on or welded bell and valley or saddle gasket meeting the soil tight performance requirements of ASTM F 2306.

2.04 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band

assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.

1. Sleeve Material for Concrete Pipe: ASTM C 443, rubber.
 2. Sleeve Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
 3. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
 4. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
- B. Bushing-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric bushing fabricated to mate with OD of smaller pipe and ID of adjoining larger pipe, for nonpressure joints.
1. Material for Concrete Pipe: ASTM C 443, rubber.
 2. Material for Cast-Iron Soil Pipe: ASTM C 564, rubber.
 3. Material for Plastic Pipe: ASTM F 477, elastomeric seal.
 4. Material for Dissimilar Pipe: Compatible with pipe materials being joined.
- C. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

2.05 MANHOLES

- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Diameter: 48 inches minimum, unless otherwise indicated.
 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 6. Gaskets: ASTM C 443, rubber.
 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
 8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
 2. Gaskets: Rubber.
 3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.

4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
- D. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

2.06 CATCH BASINS

- A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
 3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 4. Gaskets: ASTM C 443, rubber.
 5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Heavy-Traffic, Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.
1. Gaskets: Rubber.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch

intervals. Omit steps for catch basins less than 60 inches deep.

4. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
 1. Bottom, Walls, and Top: Reinforced concrete.
 2. Channels and Benches: Concrete.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
- D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.
 1. Size: 24 by 24 inches minimum, unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.
- E. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.
 1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.
- F. PVC Surface Inlets: PVC surface drainage inlets shall include the drain basin type as indicated on the contract drawing and referenced within the contract specifications. The ductile iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer.

2.07 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.
- B. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- C. Frames and Grates: Heavy-duty frames and grates according to utility standards.
- D. Trench Drains: Shall be manufactured by same vendor as frame and grate.
 1. Channel shape shall be U
 2. Minimum channel slope shall be 0.5%
 3. Grate shall be secured to the frame.
 4. Channel shall have bottom outlet or trench drain catch basin.
 5. Trench drain frame and grates shall be minimum load class "c" unless otherwise noted

2.08 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
 1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious

ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious ratio.
1. Include channels and benches in manholes.
 - a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - 1) Invert Slope: 1 percent through manhole.
 - b. Benches: Concrete, sloped to drain into channel.
 - 1) Slope: 4 percent.
 2. Include channels in catch basins.
 - a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - 1) Invert Slope: 1 percent through catch basin.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

PART 3 - EXECUTION

3.01 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.02 PIPING APPLICATIONS

- A. General: Include watertight, silttight, or soiltight joints, unless watertight or silttight joints are indicated.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow Piping: Use the following:
1. NPS 3: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. NPS 3: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and
 3. NPS 4 to NPS 6: Hub-and-spigot, Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 4. NPS 4 to NPS 6: Hubless cast-iron soil pipe and fittings, couplings, and coupled joints.
 5. NPS 4 and NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
 6. NPS 8 to NPS 15: Ductile-iron sewer pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints in NPS 8 to NPS 12. Use ductile-iron culvert pipe; standard-pattern, ductile-iron fittings; gaskets; and gasketed joints in NPS 14 to NPS 16.

7. NPS 8 to NPS 15: Corrugated-aluminum pipe and fittings, connecting bands, and banded joints.
8. NPS 8 to NPS 15: Corrugated PE drainage tubing and fittings, soiltight couplings, and coupled joints in NPS 8 and NPS 10. Use corrugated PE pipe and fittings, soiltight couplings, and coupled joints in NPS 12 and NPS 15.
9. NPS 8 to NPS 15: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.

3.03 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
 1. Use the following pipe couplings for nonpressure applications:
 - a. Sleeve type to join piping, of same size, or with small difference in OD.
 - b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
 - c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.
- B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.04 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
- F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

3.05 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Refer to Division 2 Section "Utility Materials" for basic piping joint construction and installation.
- C. Hub-and-Spigot, Cast-Iron Soil Pipe and Fittings: With rubber gaskets according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook." Use gaskets that match class of pipe and fittings.

- D. Hubless Cast-Iron Soil Pipe and Fittings: With CISPI-type couplings according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
- E. Hubless Cast-Iron Soil Pipe and Fittings: With heavy-duty-type couplings according to CISPI 310, CISPI's "Cast Iron Soil Pipe and Fittings Handbook," and coupling manufacturer's written instructions.
- F. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.
- G. Install with top surfaces of components, except piping, flush with finished surface.
- H. PE Pipe and Fittings: As follows:
 - 1. Join pipe, tubing, and fittings with couplings for soiltight joints according to manufacturer's written instructions.
 - 2. Install according to ASTM D 2321 and manufacturer's written instructions.
 - 3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
- I. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.
- J. PVC Sewer Pipe and Fittings: As follows:
 - 1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
 - 2. Install according to ASTM D 2321.
- K. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
 - 1. Round Pipe and Fittings: ASTM C 443, rubber gaskets.
- L. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- M. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.06 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.
- C. Install precast concrete manhole sections with gaskets according to ASTM C 891.
- D. Construct cast-in-place manholes as indicated.
- E. Install fiberglass manholes according to manufacturer's written instructions.

3.07 CATCH-BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.
- C. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or other granular material meeting the requirements of class 2 material as defined in ASTM D2321. Bedding and backfill for surface drainage inlets shall be placed and compacted uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade. No brick, stone or concrete block will be required to set the grate to the final grade height. For H-20 load rated installations, a concrete ring will be poured under and around the grate and frame. The concrete slab must be designed taking into consideration local

soil conditions, traffic loading, and other applicable design factors. For other installation considerations such as migration of fines, ground water, and soft foundations refer to ASTM D2321 guidelines.

3.08 STORM DRAINAGE INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipators at outlets, as indicated.

3.09 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.10 DRAINAGE SYSTEM INSTALLATION

- A. Assemble and install components according to manufacturer's written instructions.
- B. Install with top surfaces of components, except piping, flush with finished surface.
- C. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- D. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.
- E. Fasten grates to channel sections if indicated.
- F. Embed trench sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

3.11 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use light-duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 - 2. Use medium-duty, top-loading classification cleanouts in paved foot-traffic areas.
 - 3. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
 - 4. Use extra-heavy-duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.12 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
- B. Fasten grates to drains if indicated.
- C. Set drain frames and covers with tops flush with pavement surface.

3.13 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth

pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
- B. Abandoned Structures: Excavate around structure as required and use one procedure below:
1. Remove structure and close open ends of remaining piping.
 2. Backfill to grade according to Division 31 Section "Earthwork."

3.14 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
1. In large, accessible piping, brushes and brooms may be used for cleaning.
 2. Place plug in end of incomplete piping at end of day and when work stops.
 3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
1. Submit separate reports for each system inspection.
 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 4. Reinspect and repeat procedure until results are satisfactory.
- C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to authorities having jurisdiction.
 3. Leaks and loss in test pressure constitute defects that must be repaired.
 4. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 33 51 00
NATURAL GAS DISTRIBUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes piping, valves, and specialties for natural gas distribution outside the building.
- B. This Section does not include final connection to utility's natural gas main.

1.03 DEFINITIONS

- A. Gas Main: Utility's natural gas piping.
- B. Gas Distribution: Piping from gas main to individual service-meter assemblies.
- C. Service-Meter Assembly: Piping, valves, service regulator, service meter, and specialties.
- D. Point of Delivery: Piping outlet from service-meter assembly.
- E. Natural Gas Piping: Piping that conveys natural gas from point of delivery to natural gas utilization devices inside building.
- F. PE: Polyethylene plastic.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Ratings: According to the following:
 - 1. Piping and Valves: 100 psig (690 kPa).
 - 2. Service Regulators: 65 psig (450 kPa).
 - 3. Service Meters: 5 psig (34.5 kPa).

1.05 SUBMITTALS

- A. Product Data: Include identification materials and devices; and pressure ratings, rated capacities, and settings for the following:
 - 1. Service meter assembly components. Include valves, regulators, meter bars, meters, and specialty fittings.
 - 2. PE valves.
 - 3. Earthquake valves.
 - 4. Piping specialties.
- B. Shop Drawings: Include pipe sizes, valves, regulators, gas meters, and specialties. Include details of service-meter assembly and underground piping. Indicate interface and spatial relationship between piping, adjacent utilities, and proximate structures.
- C. Welding Certificates: Copies of certificates for welding procedures and personnel.
- D. Test Reports: As specified in "Field Quality Control" Article.
- E. Maintenance Data: For service regulators, service meters, and specialty valves to include in maintenance manuals specified in Division 1.

1.06 QUALITY ASSURANCE

- A. Distribution Components: Listing/approval stamp, label, or other marking by testing agency acceptable to authorities having jurisdiction.

- B. Comply with requirements of utility supplying natural gas.
- C. Comply with standards of authorities having jurisdiction for natural gas piping systems. Include materials, installation, and testing.
- D. Comply with NFPA 54, "National Fuel Gas Code," for gas piping materials and components; installations; and inspection, testing, and purging.
- E. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle liquids to avoid spillage and ignition. Notify gas supplier. Do not leave flammable liquids on premises overnight.
- B. Preparation for Transport: Prepare valves and specialties for shipping as follows:
 - 1. Ensure that units are dry and internally protected against rust and corrosion.
 - 2. Protect against damage to threaded ends, flange faces, and weld ends.
 - 3. Set valves in position for handling that avoids damage to seats and operating parts.
- C. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent damage and entrance of dirt, debris, and moisture.
- D. Store valves and specialties with end protectors in place, unless necessary for inspection; then reinstall for storage.
- E. Store valves and specialties indoors and maintain temperature higher than ambient dew-point temperature. Support off ground or pavement in watertight enclosures if outdoor storage is necessary.
- F. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor if stored inside.
- G. Protect flanges, fittings, and piping specialties from moisture and dirt.
- H. Store plastic pipes and valves protected from direct sunlight. Support pipes to prevent sagging and bending.

1.08 PROJECT CONDITIONS

- A. Perform site survey, research public utility records and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.

1.09 COORDINATION

- A. Coordinate connection to gas main with utility.
- B. Coordinate pipe materials, sizes, entry locations, and pressure requirements with natural gas piping.
- C. Coordinate with other utility Work.

- D. Work Interruptions: Leave natural gas distribution piping in safe condition if interruptions in Work occur while alterations or repairs are being made to existing gas piping.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work which include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Non-lubricated, Tapered Plug Valves:
 - a. Essex Brass Corp.
 - b. Grinnell Corp.; Mueller Co.; Gas Products Div.
 - c. Lyall: R.W. Lyall & Co., Inc.
 - d. McDonald: A.Y. McDonald Mfg. Co.
 2. Lubricated, Tapered Plug Valves:
 - a. Grinnell Corp.; Mueller Co.; Gas Products Div.
 - b. National Meter.
 - c. Nordstrom Valves, Inc.
 3. Ball Valves:
 - a. Conbraco Industries, Inc.
 - b. Hammond Valve Corp.
 - c. Maxitrol Co.
 - d. Milwaukee Valve Co., Inc.
 - e. Nibco, Inc.
 - f. Stockham Valves & Fittings, Inc.
 - g. Watts Industries, Inc.; Water Products Div.
 4. Lubricated Plug Valves:
 - a. Huber: J.M. Huber Corp.; Flow Control Div.
 - b. Milliken Valve Co., Inc.
 - c. Nordstrom Valves, Inc.
 - d. Olson Technologies, Inc.; Homestead Valve Div.
 - e. Walworth Co.
 5. Non-lubricated Plug Valves:
 - a. General Signal; DeZurik Unit.
 - b. Keystone Valve USA, Inc.
 - c. Milliken Valve Co., Inc.
 - d. Olson Technologies, Inc.; Homestead Valve Div.
 6. Plastic Valves:
 - a. Kerotest Manufacturing Corp.

- b. Lyall: R.W. Lyall & Co., Inc.
 - c. Nordstrom Valves, Inc.
 - d. Perfection Corp.; Gas Products Div.
7. Earthquake Valves:
- a. Pacific Seismic Products, Ltd.
 - b. Quake Defense, Inc.; Emergency Fail-Safe Systems.
 - c. Quakemaster Seismic Safety Systems.
 - d. SafeTQuake Corp.
 - e. Seismic Safety Products, Inc.
 - f. Westcoast Seismic Protection Co., Ltd.
8. Service Regulators:
- a. American Meter Co.
 - b. Equimeter, Inc.
 - c. Fisher Controls International, Inc.
 - d. National Meter.
 - e. Schlumberger Industries; Gas Div.
9. Service-Meter Bars:
- a. Fisher Controls International, Inc.
 - b. Grinnell Corp.; Mueller Co.; Gas Products Div.
 - c. McDonald: A.Y. McDonald Mfg. Co.
 - d. National Meter.
 - e. Schlumberger Industries; Gas Div.
10. Service Meters:
- a. American Meter Co.
 - b. Badger Meter, Inc.; Badger/Instromet, LLC Div.
 - c. Equimeter, Inc.
 - d. Fisher Controls International, Inc.
 - e. National Meter.
 - f. Schlumberger Industries; Gas Div.
11. Service-Meter, Bypass Fittings:
- a. Lyall: R.W. Lyall & Co., Inc.
 - b. Williamson: T.D. Williamson, Inc.
 - c. Schlumberger Industries; Gas Div.

2.02 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.03 PIPES

- A. Steel Pipe: ASTM A 53, Type E or S, Grade B; Schedule 40, black.

- B. PE Pipe: ASTM D 2513, SDR 11.

2.04 PIPE FITTINGS

- A. Malleable-Iron Fittings: ASME B16.3, Class 150, standard pattern with threads complying with ASME B1.20.1.
- B. Unions: ASME B16.39, Class 150, black malleable iron; female pattern; brass-to-iron seat; ground joint.
- C. Steel Fittings: ASME B16.9, wrought-steel butt-welding type; and ASME B16.11, forged steel.
- D. Steel Flanges and Flanged Fittings: ASME B16.5.
- E. PE Fittings: ASTM D 2683, socket type or ASTM D 3261, butt type with dimensions matching ASTM D 2513, SDR 11, PE pipe.
- F. Transition Fittings: Type, material, and with end connections matching piping being joined.

2.05 JOINING MATERIALS

- A. Components, Tapes, Gaskets, and Bolts and Nuts: Suitable for natural gas and as recommended by piping manufacturer.

2.06 SHUTOFF VALVES

- A. Description: Manual-operation valves suitable for natural gas service and with 100-psig (690-kPa) minimum working-pressure rating.
 - 1. Threaded Valves, 1-Inch NPS (DN25) and Smaller: Include listing by agency acceptable to authorities having jurisdiction.
- B. Non-lubricated, Tapered Plug Valves: Brass or cast-iron body, with brass tapered plug; lever operation; and complying with ASME B16.33, MSS SP-78, UL 842, or AGA/IAS listing. Include lever.
 - 1. Option: Include locking device.
- C. Lubricated, Tapered Plug Valves: Cast-iron body, with lubricated, brass tapered plug; lever operation; and complying with ASME B16.33, MSS SP-78, UL 842, or AGA/IAS listing. Include lever.
 - 1. Option: Include locking device.
- D. Ball Valves: Bronze body, with chrome-plated brass ball lever handle and complying with ASME B16.33, MSS SP-110, UL 842, or AGA/IAS listing.
 - 1. Option: Include locking device.
- E. Lubricated Plug Valves: Cast-iron body, with lubricated, tapered, or cylindrical plug; lever operation; and complying with ASME B16.38, MSS SP-78, UL 842, or AGA/IAS listing.
 - 1. Option: Include locking device.
- F. Non-lubricated Plug Valves: Cast-iron body, with eccentric plug with resilient coating; lever operation; and complying with ASME B16.38, MSS SP-108, UL 842, or AGA/IAS listing.
 - 1. Option: Include locking device.
- G. Plastic Valves: PE made for gas distribution, with nut or flat head for key operation, and complying with ASME B16.40, UL 842, or AGA/IAS listing.
- H. Valve Boxes: Cast-iron, two-section box. Include top section with cover with "GAS" lettering, bottom section with base to fit over valve and barrel 5 inches (125 mm) in diameter, and adjustable cast-iron extension of length required for depth of bury. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head and stem of length required to operate valve.

2.07 SERVICE REGULATORS

- A. Description: AGA/IAS-listed for service regulators, single stage, steel jacketed, and corrosion resistant. Include atmospheric vent, elevation compensator, with threaded ends for 2-inch NPS (DN50) and smaller, and flanged ends for 2-1/2-inch NPS (DN65) and larger.
- B. Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening.

2.08 SERVICE METERS

- A. Service Meters: Positive-displacement, gas meter. Include metal case, temperature compensation, and corrosion-resistant internal components. Include threaded ends for 2-inch NPS (DN50) and smaller, and flanged ends for 2-1/2-inch NPS (DN65) and larger.
 - 1. Type: ANSI B109.1, diaphragm type, with registration in cubic feet (cubic meters) for meters with capacities 500 cfh (3935 mL/s) and less.
 - 2. Type: ANSI B109.2, diaphragm type, with registration in cubic feet (cubic meters) for meters with capacities more than 500 cfh (3935 mL/s).
 - 3. Type: ANSI B109.3, rotary type, with registration in cubic feet (cubic meters).
- B. Service-Meter Bars: Malleable- or cast-iron frame for supporting service meter. Include offset swivel pipes, nuts with O-ring seal, factory- or field-installed dielectric unions, and threaded ends.
 - 1. Exception: Omit offset swivel pipes, if dimensions match meter connections.
- C. Service-Meter, Bypass Fitting: Ferrous, tee, pipe fitting with integral ball check valve and capped side inlet for temporary natural gas supply.

2.09 EARTHQUAKE VALVES

- A. Description: ANSI Z21.70, mechanical-operation, automatic-shutoff earthquake valve. Include threaded ends for valves 2-inch NPS (DN50) and smaller, and flanged ends for valves 2-1/2-inch NPS (DN65) and larger.

2.10 PIPING SPECIALTIES

- A. Service Line Risers: PE pipe with coated, annodeless, steel pipe casing on riser section. Include inlet for heat-fusion connection to PE pipe and outlet for connection to shutoff valve.
- B. Strainers: Y-pattern, full size of connecting piping. Include ASTM A 666, Type 304 stainless-steel screens with 3/64-inch (1.2-mm) perforations, unless otherwise indicated.
 - 1. Pressure Rating: 125-psig (860-kPa) minimum steam or 175-psig (1207-kPa) WOG working pressure.
 - 2. 2-Inch NPS (DN50) and Smaller: Bronze body, with female threaded ends.
 - 3. 2-1/2-Inch NPS (DN65) and Larger: Cast-iron body, with flanged ends.
 - 4. Screwed screen retainer with centered blow-down and pipe plug.

2.11 CONCRETE BASES

- A. Concrete Bases: Precast, reinforced, made of 3000-psi- (20.7-MPa-) minimum, 28-day compressive strength concrete; and 4 inches (100 mm) thick and 4 inches (100 mm) larger in dimension than supported item, unless otherwise indicated.

PART 3 - EXECUTION

3.01 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.02 PREPARATION

- A. Close equipment shutoff valves before turning off gas to premises or piping section.
- B. Inspect natural gas piping according to NFPA 54 to determine that natural gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54, Part 1, "Prevention of Accidental Ignition" Paragraph.

3.03 PIPING APPLICATIONS

- A. Flanges, unions, transition and special fittings, and valves with pressure ratings same or higher than system pressure rating may be used, unless otherwise indicated.
- B. Aboveground Piping: Use the following:
 - 1. 2-Inch NPS (DN50) and Smaller: Steel pipe, butt-welding-type fittings, and welded joints. Joints for connection to threaded service regulators, service meters, and valves may be threaded.
 - 2. 2-1/2-Inch NPS (DN65) and Larger: Steel pipe, butt-welding-type fittings, and welded joints. Joints for connection to service regulators, service meters, and valves with flanged connections may be flanged. Joints for connection to service regulators, service meters, and valves with threaded connections 2-1/2- to 4-inch NPS (DN65 to DN100) may be threaded.
- C. Underground Piping: Use PE pipe, PE fittings, and heat-fusion joints.

3.04 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. If specific valve types are not indicated, the following requirements apply:
 - 1. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping gas mains.
 - 2. Underground: Use plastic valves.
 - 3. Aboveground, 2-Inch NPS (DN50) and Smaller: Ball valves.
 - 4. Aboveground, 2-1/2-Inch NPS (DN65) and Larger: Nonlubricated plug valves.

3.05 JOINT CONSTRUCTION

- A. Refer to Division 33 Section "Utility Materials" for basic piping joint construction.
- B. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.
- C. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

3.06 PIPING INSTALLATION

- A. Install buried gas distribution piping at least 36 inches (900 mm).
- B. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum length nipple of three pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- C. Install strainers on inset side of service regulators and earthquake valves.
- D. Terminate vent piping with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

- E. Install underground, plastic, gas distribution piping according to ASTM D 2774.

3.07 VALVE INSTALLATION

- A. Install plastic shutoff valves on branch connections to existing underground gas distribution piping. Install valves with valve boxes.
- B. Install metal shutoff valves on aboveground, gas distribution piping.
- C. Install aboveground, metal shutoff valves in accessible locations, protected from physical damage. Include metal tag indicating piping systems supplied, attached to valve with metal chain.
- D. Install earthquake valves according to manufacturer's written instructions.

3.08 SERVICE-METER ASSEMBLY INSTALLATIONS

- A. Install service-meter assemblies aboveground, on pre-cast concrete bases.
- B. Install metal shutoff valves and strainers upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.
- C. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.
- D. Install service meters downstream from pressure regulators.
- E. Install pressure-relief or pressure-limiting devices so they can be readily operated to determine if device is free, tested to determine pressure at which they will operate, and examined for leakage if closed.
- F. Terminate service-regulator vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

3.09 CONNECTIONS

- A. Connect gas distribution piping to natural gas source and extend to service-meter assemblies and points indicated. Terminate piping with caps, plugs, or flanges, as required for piping material. Connect to building natural gas piping if it is installed. Refer to Division 22 Section "Natural Gas Piping" for building natural gas piping.
- B. Connect to utility gas main according to utility's procedures and requirements.
- C. Connect to existing gas distribution main according to ASME B31.8.

3.10 ELECTRICAL BONDING AND GROUNDING

- A. Install aboveground, natural gas distribution piping upstream from equipment shutoff valves, electrically continuous, and bonded to grounding electrode according to NFPA 70.
- B. Do not use gas piping as grounding electrode.

3.11 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, meter, and earthquake valve.
 - 1. Text: Distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to name of identified unit.
- B. Refer to Division 33 Section "Utility Materials" for equipment nameplates and signs.
- C. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape during backfilling of trenches for piping.
- D. Refer to Division 31 Section "Earthwork" for warning tapes.

3.12 FIELD QUALITY CONTROL

- A. Inspect, test, and purge natural gas distribution according to NFPA 54, Part 4, "Inspection, Testing, and Purging," and utility requirements.
- B. Repair leaks and defects with new materials and retest system until there are no leaks.
- C. Report test results in writing to Architect and authorities having jurisdiction.
- D. Verify capacities and pressure ratings of service regulators and meters and earthquake valves.
- E. Verify correct pressure settings for service regulators.

3.13 ADJUSTING

- A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION