ARCHITECTURE TECHNOLOGY, P.C.

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PROJECT MANUAL

WOLVERINE POWER SUPPLY COOPERATIVE, INC.

ELMIRA SERVICE CENTER

Project Location:	Highway M-32, Elmira Warner Twp., Antrim County, Michigan
Project Owner:	Wolverine Power Supply Cooperative, Inc.
Issued:	01/28/21
Architect:	Architecture Technology, P.C.
Site/Civil Engineer:	Jozwiak Consulting, Inc.
M-E-P Engineer:	Nealis Engineering, Inc.
Structural Engineer:	Apex Engineering & Management, Inc.
Construction Manager:	Apex Engineering & Management, Inc.

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SEALS PAGE

Professional Seals:

Architect:

Structural Engineer:

M-E-P Engineer:

Site/Civil Engineer:

END OF SECTION

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Note: Drawing list does not include sheets issued in Addenda, nor drawing revisions and clarifications issued during the construction period.

END OF SECTION

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ADVERTISEMENT FOR BIDS

Wolverine Power Supply Cooperative, Inc. & Apex Engineering & Management will receive sealed bids for the Elmira Service Center.

Bids are to be addressed to Wolverine Power Supply Cooperative, Inc. and can be delivered to either Apex Engineering & Management - 5101 Sawyer Woods Dr., Traverse City, MI, 49685 or Wolverine Power Cooperative, Inc. – 10125 W. Watergate Rd., Cadillac, MI 49601 until **2:00pm local time, February 26, 2021**. Bids received after 2:00pm will not be considered. Bids can be emailed to CM – steve@apexem.net by the bid time noted. If you email your bid, please follow up with a phone call to CM – 231.275.2600 to confirm receipt of bid. Call must be made by bid due date & time.

A pre-bid meeting will NOT be conducted, if you would like to visit the site, please email in advance and we can coordinate that with you – steve@apexem.net

Bidders are strongly encouraged to attend in order to familiarize themselves with the project and site, as well as a having discussion of the project. Bids will be privately opened.

Proposals will be received for the following Bid Packages:
BP-01 Sitework
BP-02 Concrete
BP-03 General Trades (will not be bid - negotiated)
BP-04 Pre-Engineered Metal Building
BP-05 Sectional OH Door
BP-06 Gypsum Board-Light Gauge Framing-Ceiling
BP-07 Painting
BP-08 Casework-Counters
BP-09 Fire Suppression
BP-10 Plumbing-HVAC
BP-11 Electrical
Data-Security - (will not be bid - negotiated)

No direct contact will be allowed with the Owner. Direct all questions to the Construction Manager - Apex Engineering & Mgt (231.275.2600). Email can also be used – steve@apexem.net

The plans and specifications will be available via digital email transfer or hard copy pickup from Apex Engineering. Hard copy sets of plans and specs may be obtained from the Construction Manager, Apex Engineering & Mgt for a refundable deposit of $100. **Please contact our office and a set will be available either for pickup after 2/15/21.** The deposit will only be refunded for contract document sets returned in useable condition. In addition, a separate non-refundable deposit of $50 per set is required for sets that must be mailed. Checks for deposits/mailing shall be made out to Apex Engineering & Mgt. All bidders will be responsible for the entire set of Contract Documents.

Proposals shall be submitted on Proposal Forms furnished by the Construction Manager as part of the Bidding Documents and shall be executed in strict accordance with the Drawings and Specifications.

Successful bidders will contract directly with Wolverine Power, Inc. for the performance of this work. Apex Engineering & Mgt will act as the Owner's representative and manage the project. No Bidder may withdraw their bid within 30 days of the actual bid opening. The Owner and Construction Manager reserve the right to reject any or all bids, to accept other than a low bid, to waive informalities in any or all bids and to accept the bid, which, in their opinion, is in the best interest of Wolverine Power Cooperative, Inc.

End of Section

SECTION 00 21 13
INSTRUCTIONS TO BIDDERS

BID SCOPE DOCUMENT
WOLVERINE POWER COOPERATIVE
ELMIRA SERVICE CENTER

BIDS DUE: February 26, 2021 – 2:00pm

ARTICLE 1

DEFINITIONS & GENERAL REQUIREMENTS

1.1 Bidding documents include the Advertisement for Bids, the Instructions To Bidders, the Scopes of Bids, the Bid Proposal Form, the AIA General Conditions Of The Contract, the Supplemental Conditions of the Contract, the Technical Specifications and the Drawings including alternate pricing as requested and addenda issued prior to the receipt of bids.

1.2 All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A232-2009, or in other contract documents are applicable to the bidding documents.

1.3 Addenda are written or graphic instruments issued by the Architect and/or the Construction Manager prior to the execution of the contract which modify or interpret the bidding documents by addition, deletion, clarification or corrections.

1.4 A bid is a complete and properly signed proposal to do the work or designated portion thereof for the sums stipulated therein supported by data called for by the bidding documents.

1.5 The base bid is the sum stated in the bid for which the bidder offers to perform the work described as the base, to which work may be added or deducted for sums stated in alternate bids.

1.6 An alternate bid (or alternate) is an amount stated in the bid to be added or deducted from the amount of the base bid if the corresponding change in project scope or materials or methods of construction described in the bidding documents is accepted.

1.7 A unit price is an amount stated in the bid as a price per unit of measurement for materials or services as described in the contract documents.

1.8 A bidder is one who submits a bid for a contract with the Owner for the work described in the proposed contract documents. All successful bidders will have contracts with Wolverine Power Cooperative.

1.9 A sub-bidder is one who submits a bid to a bidder for materials and/or labor for a portion of the work.

1.10 A bid package is a unit of work to be bid, performed by a Trade Contractor and his subcontractors, which forms part of the total project as identified in the Scopes of Bids. The term bid package should not be confused with the term technical division. The technical division specifies quality and performance; the bid package denotes work scope.

1.11 A bid package description is a written description of the scope of the work to be performed by a bidder in a specific bid package.

ARTICLE 2

BIDDER'S INFORMATION

2.1 BID PACKAGE UNIT

Although each bid package includes a somewhat conventional segment of subcontracting, multiple contract performance requires that adjustments be made to permit the completion of a bid package as a construction unit. Each bidder is to review the total scope of his responsibilities, as well as, the responsibilities of other contractors. The bidder shall include all provisions to provide material and labor for the package bid and provisions to work with and around other contractors working on other bid packages.

2.2 SCOPE OF BIDS

For clarification purposes, the scope of the work involved in each bidding package is specified in two categories: "INCLUDED", and "RELATED ITEMS". Information provided under the heading "RELATED ITEMS" is for the purpose of noting a point of beginning and/or to eliminate fringe involvement that may be inadvertently included in the scope of the work. Information under this heading is not always required to define the bidding package. "INCLUDED" items are the obvious and/or conventional work scope of a bid package.

2.3 MANDATORY INTERFACES

The scope of each bidder's work is defined in the description of his bidding package. Each bidder shall familiarize himself with the requirements of those bid packages that interface with his own. He shall consider the fact that his work follows the work of another Trade Contractor and that still another Trade Contractor will interface with the work of his bid package.

2.4 This is not a Prevailing Wage project.

ARTICLE 3

BIDDER'S REPRESENTATION

3.1 Each bidder by making his bid represents that:

- He has carefully examined all drawings and read all divisions of the specifications and all other contract documents to avoid omissions and/or duplications and to insure a complete job.
- He has read and understands the bidding documents and his bid is made in full accordance therewith, without exception.
- He has visited the site and has familiarized himself with the local conditions under which the work is to be performed.
- His base bid is based upon the materials, systems and equipment described in the bidding documents without exceptions.

3.2 Failure to inform himself fully of the conditions relating to the construction of the project and the employment of labor therein will not relieve a successful bidder of his obligation to furnish all materials and labor necessary to carry out the provisions of his contract.

3.3 The bidder further represents that neither his work nor the work of other bid package Trade Contractors will be prejudiced because of sex, race, color, creed, or labor affiliation of other Trade Contractors under contract to the Owner of this project.

ARTICLE 4

BIDDING DOCUMENTS

4.1 COPIES

Bidders may obtain complete sets of bidding documents from the Construction Manager.
Complete sets of bidding documents shall be used in preparing bids; neither the Construction Manager, the Architect nor the Owner assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of bidding documents.

The Construction Manager or Architect in making copies of the bidding documents available on the above terms, do so only for the purpose of obtaining bids on the work and do not confer a license or grant for any other use.

Requirements for a specific trade or contract will generally be described in that portion of the specifications or drawings related to that trade or contract. Such requirements may, however, be described in other sections of the contract documents. Before submitting proposal, bidders shall, therefore, carefully examine all drawings and read all divisions of the specifications and all contract documents to avoid omissions or duplications and to insure a complete job.

If a bidder claims an inability to meet any requirement set forth on the contract documents, or that any requirements of these documents is impractical or unreasonable, such claim shall be made in writing prior to the time proposals are submitted. Any such claim made after receipt of bids will not be recognized.

4.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

Bidders shall promptly notify the Construction Manager of any ambiguity, inconsistency or error, which they may discover upon examination of the bidding documents, or of the site and local conditions.

Bidders requiring clarification or interpretation of the bidding documents shall make a written request to the Architect, to reach him at least seven days prior to the date for receipt of bids.

Any interpretation, correction or change of the bidding documents will be made by addendum. Interpretations, corrections or changing of the bidding documents made in any other manner will not be binding, and bidders shall not rely upon such interpretations, corrections and changes.

4.3 SUBSTITUTIONS

The materials, products and equipment described in the bidding documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

No substitution will be considered unless it shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawing cuts performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitution would require should be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The contractor proposing the substitution is responsible for any changes that affect his trade or any adjacent trades work by using the substituted product. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

Where items or equipment and/or materials are specifically identified by a manufacturer's name, model or catalog number, only such specified items may be used in the base bid. Manufacturers desiring approval of products not specified may submit data for Architect's consideration not less than five (5) days prior to the proposed bid date. Bidders will be notified only by addendum of additional approved manufacturers.

4.4 ADDENDA

Addenda will be mailed or delivered to all that are known by the Construction Manager to have received a complete set of bidding documents.

Copies of addenda will be made available for inspection wherever bidding documents are on file for that purpose.

No addenda will be issued later than two days prior to the date for receipt of bids except an addendum, if necessary, postponing the date for receipt of bids or withdrawing the request for bids.

Each bidder shall ascertain prior to submitting his bid that he has received all addenda issued and he shall acknowledge their receipt on his bid.

ARTICLE 5

BIDDING PROCEDURE

5.1 FORM AND STYLE OF BIDS

Bids shall be submitted on the forms provided by the Construction Manager (copies included herewith). Failure to do so will jeopardize the bidder's chance of receiving an award.

All blanks on the bid form shall be filled in by typewriter or manually in black ink. If any space provided is not utilized, that space shall be filled in with the notation "N/A" (not applicable)

Where so indicated by the makeup of the bid form, sums shall be expressed in both words and figures, and in the case of discrepancy between the two, the amount written in words shall govern.

The signer of the bid must initial any interlineations, alteration or erasure.

All requested alternates shall be bid with all spaces filled or Proposal can be considered incomplete.

Bidders shall make no additional stipulations, notations or statements on the bid form nor qualify his bid in any other manner.

Each bid shall include the legal name of bidder and statement whether bidder is a sole proprietor, a partnership, a corporation, or any other legal entity, and shall be signed by the person or persons legally authorized to bind the bidder to a contract. A bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A bid submitted by an agent shall have a current Power of Attorney attached certifying agent's authority to bind bidder.

Negligence in preparation, improper preparation, errors in and/or omissions from proposals shall not relieve bidder from fulfillment of any and all obligations and requirements of the contract documents.

No responsibility shall attach to the Architect, the Owner, or the Construction Manager, or their authorized representatives for the premature opening of any proposal, which is not properly addressed and identified.

There is no limit as to the number of bid packages any one bidder can bid. However, each bidder is required to enter a figure for each and every bid package he is bidding in order to be considered for that package. Space is provided in the proposal form to accommodate combined proposals, if any bidder, bidding more than one bid package, wishes to be considered on this alternate basis.

The award of all bid packages will be based on the dollar value of the proposal, the qualifications of the bidder and his ability to perform. Bidders are cautioned to fill in all blanks on the pages of the bid form he is submitting by noting "N/A" in those blanks not applicable to their particular proposal.

The Owner reserves the right to accept or reject any or all proposals or to waive irregularities. In addition, the Owner reserves the right to reject any proposal which fails to include the required bid security or any other proposal supplement, or which is in any way incomplete.

5.2 BID SECURITY – **Not required**

5.3 SUBMISSION OF BIDS

Bids shall be delivered, mailed or emailed at the designated location prior to the time and date for receipt of bids indicated in the Advertisement or Notice to Bidders, or any extension thereof made by addendum. Bids received after the time and date for receipt of bids will be returned unopened or not considered.

Bidders shall assume full responsibility for timely delivery at the location designated for receipt of bids.

5.4 MODIFICATION OR WITHDRAWAL OF BID

A bid may not be modified, withdrawn or cancelled by the bidder for a period of thirty consecutive calendar days following the time and date designated for receipt of bids, and bidder so agrees in submitting his bid.

Prior to the time and date designated for receipt of bids, bids submitted early may be modified or withdrawn only by notice to the party receiving bids at the place and prior to the time designated for receipt of bids. Such notice shall be in writing over the signature of the bidder or be by telegram. If by telegram, written confirmation over their signature of bidder must have been mailed and postmarked on or before the date and time set for receipt of bids. It shall be so worded as not to reveal the amount of the original bid.

Withdrawn bids may be re-submitted up to the time designated for the receipt of bids provided that they are then fully in conformance with these Instructions to Bidders and that bid security is in an amount sufficient for the bid as modified or re-submitted.

ARTICLE 6

CONSIDERATION OF BIDS

6.1 OPENING OF BIDS

Properly identified bids received on time will be opened privately; the amounts of the base bids and alternates may or may not be made available to bidders.

6.2 ACCEPTANCE OR REJECTION OF BIDS

The Owner shall have the right to reject any or all bids.

The Owner shall have the right to waive any informality or irregularity in any bid received.

The Owner shall have the right to accept alternates in any order or combination and to determine the low bidder on the basis of the sum of the base bid and the alternates accepted.

The bidder acknowledges the right of the Owner to accept any combination of bid packages he so desires.

The bidder, by submitting his bid, represents that he will accept award, regardless of who the other bid package Trade Contractors may be.

After receipt of bids, the bidder may be required to identify specific subcontractors, suppliers and manufacturers for work included in his bid package, and to satisfy the Construction Manager, the Architect, and the Owner that both, he and the subcontractors, suppliers and manufacturers identified will be able to satisfactorily undertake the work required by the contract.

If the bidder is advised in writing of a substantial objection to any organization so identified when such organization would not otherwise have been disallowed by requirements of the bidding documents, the bidder may, at his option, (1) withdraw his bid, or (2) submit an acceptable substitute with, if he chooses, an increase in his bid price to cover the difference in cost occasioned by such substitution. The Owner may at his discretion, accept the increased bid price or he may disqualify the bidder. In the event of either withdrawal or disqualification under this sub-paragraph, bid security will not be forfeited, notwithstanding anything to the contrary in Article 5.

Subcontractors and other persons and organizations proposed by the bids and accepted by the Owner and the Architect must be used on the work which they were proposed and accepted and shall not be changed except with the written approval of the Owner.

ARTICLE 7

POST-BID INFORMATION

7.1 SUBMISSIONS

Prior to the commencement of any work, the successful bidder shall submit certificates of insurance and possibly bonds, if required by Owner.

End of Section

SECTION 00 24 13
SCOPES OF BIDS

All Bid Packages are responsible for the following:

Contractor to provide all labor, materials, personnel, equipment and tools required to perform the work specified in the above referenced specification sections and project drawings. Contractor is responsible for a complete operational system(s), and if the bid package breaks the systems into multiple divisions of labor, each firm will be responsible for ensuring the system is fully operational. The contractor is also responsible to furnish, deliver, store, protect, install, erect and dispose of waste material required for the complete satisfaction of this bid division or bid package.

General Project Requirements:

1. **Work can be performed during regular business hours (7am – 5pm) Monday – Friday and Saturday if needed. Coordinate Saturday work with project superintendent.**

2. All contractors are responsible for the entire set of Contract Documents; including plans, specifications, tables, schedules and notes. It is the responsibility of the respective trade to ensure they have the most current drawings and specifications.

3. Apex Engineering & Mgt, Inc. is the CM on this project and will have supervision on the project. It is the responsibility of the respective trades to coordinate with the project supervisor and all other trades on the site.

4. There is not a general contractor on this project. All reference to general contractor within the related specification sections outlined in the bid packages and general conditions shall be performed by the respective trade contractor.

5. The contractors are responsible for daily removal and disposal of all debris into an Owner supplied dumpster. Provide continuous clean up and housekeeping of the site on a daily basis and as directed by the CM. Back charges will be implemented for failure to clean up after yourself.

6. This contractor is responsible for all safety issues for all the work that he has affected until his work is complete.

7. All contractors are required to inspect existing conditions and components to provide the work required for a fully operational system in compliance with governing codes.

8. Any contractor who knowingly compounds a mistake by installing work on another Contractor's obviously faulty work will be responsible for repair of said work.

9. Repairs must restore any damaged or compromised materials to original or better condition with no detectable evidence of repairs. Workmen experienced and employed in the line of work requiring the repair shall perform the repairs. If possible the original installer shall make the repair.

10. Provide all required layout to perform the work. Owner will provide benchmark elevations and plan offsets for contractor to work with.

11. Unloading and stocking of material and equipment is the responsibility of each Contractor. Coordinate large deliveries with the CM 48 hours prior to unloading. No means of unloading will be provided by the Owner or the CM.

12. Prior to commencing work on site, this Contractor must submit schedule of values, certificates of insurance, shop drawings and product data per Division 00 and 01 specifications.

~~13. Contractor shall submit written daily reports to the CM office. Information shall include number of personnel, deliveries made, and work completed for each day the contractor's representative is on site.~~

14. Contractor shall maintain As-Built drawings for any changes made/uncovered during the construction phase. At the end of the project, contractor shall submit As-built drawings for his/her respective trade to the CM for inclusion in (1) combined As-built drawing set to provide to the Owner.

15. Coordinate and review other Scopes of Bids for related work or work of other trades affecting contractors work.

16. The trade contractor that creates the penetration through the fire separation wall shall perform fire-stopping seal around his work using approved UL listed methods. The trade contractor installing the wall shall perform top of wall fire stopping work using approved UL listed methods.

17. Protect adjacent trades work from damage as a result of installation of this Scope of Bid work.

18. Contractor to include all requested alternate pricing, unit pricing and allowances as it relates to this Scope of Bid and as indicated on the Proposal Form.

19. Contractor shall submit all shop drawings, material certificates, warranty & close out information, etc. noted in the specification section for material they are supplying. If a contractor's work requires sealed engineering design, contractor must have professional liability insurance and provide evidence of insurance with a certificate per specifications. Note details on architectural drawings.

20. Contractor making a penetration through a wall, ceiling or floor MUST seal around this penetration at the time the penetration is made. ALL penetrations must be sealed, not just fire wall, smoke wall or smoke barrier walls. Fire wall penetration must be sealed with approved sealer. Non-fire wall penetration can be sealed with spray foam, caulking or gypsum mud.

21. **If contractor chooses to deviate from the specified materials or equipment, they MUST get approval from architect or engineer prior to submittal of shop drawings OR highlight the requested deviation within the shop dwgs. If the deviation from the specified material/equipment is not highlighted and approved by the architect/engineer, contractor will be required to supply the correct material or equipment at their own expense.**

Bid Package #1 (BP-01) Sitework

Bid Package Inclusions:

1. Site demolition – including:
    - Clear and grub as required for new work, trees, fence, concrete slab, trash/debris, junk as noted
2. Provide and install soil erosion protection (silt fencing) as indicated on C1.2 and to remain in place until final phase of site work is completed
3. Remove/strip topsoil, vegetation, mass grading, ditches, basins, excavate for parking, drives, building pad & foundation (including slab on grade prep for main bldg. & pump house) & backfill, final grade and topsoil/seed, including turf lawn and MDOT contractor mix areas as noted
4. Engineered fill meeting MDOT Class II sand shall be used for backfill of foundations.
5. Coordinate elevations with concrete contractor at time of excavation. Fine grading of final 2" of sand base by concrete contractor. Concrete contractor will provide personnel during rough grading operations acceptable to within +/-2"
6. All excess spoils shall be spread or stockpiled onsite, no removal is required ref C1.2 for location south of Service Center building and southwest of Rail Yard Siding to be used to balance site
7. Complete storm system – including structures/frames/covers, pipe, foundation drain, stone/fabric, drain lines, dissipaters, downspout collectors and piping, cleanouts, inlets/outlets, outfalls
8. Under driveway spare conduit as indicated
9. Complete sanitary system - piping from 5' outside bldg, insulation, septic tank, pump chamber, forcemain, covers, drainfield/inspection ports & conduit to pump chamber
10. Trench drain system - including piping from 5' outside bldg, insulation, oil/water separator, tanks, conduit to holding tank, alerts/floats/Night Eye alarm/pump and discharge line, shut off valve, etc.
11. Construction of new entrances, ditch re-work, sawcutting clean butt joint, including permitting (per state & county standards) & traffic control – new entrance must drain water and not pond
12. 4" gas service conduit as noted on C4.1
13. All asphalt paving, 6" gravel sub base & striping
14. All gravel pads for snow storage, equipment, material storage, trailer parking & drive to Rail Yard and Rail Yard Siding area & access drive off Chalmers St (**Note to be Bid Separately ADD Alternate**)
15. Contact MISS DIG prior to performing excavation and UG work
16. Include supply of ALL rigid insulation (vertical & horizontal) at exterior foundation wall – include installation of vertical insulation (horizontal insulation will be installed by BP-02)
17. Signage, barrier free signage at parking noted
18. Refer to Geotechnical Investigation Report included in this specification for stripping, backfilling & compaction requirements specific to this site – Entire Construction Area must be compacted per Section 5.2

Bid Package Exclusions:

1. Density testing (By Owner)
2. Construction Staking (By Owner)
3. Site signs
4. Steel pipe bollards
5. Concrete work (BP-02) – coordination with concrete contractor will be req'd
6. UG conduit banks (By BP-11)
7. Light poles & concrete bases (BP-11)
8. Generator (BP-11)
9. 7' high perimeter fence, gates (vehicle & man), controllers (By Owner)
10. Fire suppression storage tank & service line
11. Water well, tank, softener & service will be stubbed into bldg (By Owner)
12. 24" thick conc pad @ Rail Yard (C2.2), secondary containment/dirtwork for this pad (By Owner)

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with

the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. ADD Alternate for all site work @ Rail Yard Siding (ref break line on Dwg C1.1 & C1.2)

Bid Package #2 (BP-02) Concrete

Bid Package Inclusions:

1. Removal of excess concrete spoils and truck washouts from the jobsite
2. Concrete strip & pad footings including all steel reinforcement & water stop @ trench drains/spill containment
3. Concrete foundation walls & piers including all steel reinforcement (horizontal & vertical)
4. Slab on grade (all interior and exterior), reinforcing materials, vapor barriers and dowels – all areas will receive standard trowel finish interior and broom finish for exterior
5. Note – depressed slab at showers – coordinate with BP10 HVAC-Plumbing
6. Generator concrete pad (see SE1), Dumpster pad (see C2.1), 6' wide concrete apron surrounding bldg (Dwg C5.1), pad for landing gear (C2.1), pad for breaker storage (C2.1), concrete curbing & Card Reader Sonotube pedestals (see C2.1)
7. 12" thickened concrete slabs in bay between column lines 4 & 5 as indicated on S1.0
8. All concrete foundations & slabs associated with Pump House (A18)
9. Cut control joints in slab on grade, provide isolation joints, construction and all other slab accessories as indicated in the drawings or required for this work package
10. Installation only of: steel bollard posts & concrete fill (near bldg, wells, generator/septic tank area), galvanized embedded frames and grating @ Trench Drains & Liquid Containment, sleeves, conduit, etc. provided by other trades. Coordinate with other trades prior to concrete placement
11. Concrete filling of steel bollard posts
12. Hair pins & #9 tie rod assembly (couplers, end plates, bond break, concrete cover) as indicated on S1.0 and details
13. Proper curing & concrete hardener/sealer as indicated on architectural plans including weather protection – Note, Mandatory Alternate #1 is in ADDITION to this
14. Provide layout for all work in this bid package
15. Include installation of HORIZONTAL rigid insulation at exterior foundation wall (supply by BP-01)
16. Coordinate soil elevations with excavating contractor at time of excavation. Fine grading of final ± 2" of sand base by this contractor. Provide personnel during rough grading operations performed by BP-01 and acceptable to within +/-2"
17. Provide concrete mix designs prior to concrete placement
18. Coordinate footing inspections with Construction Manager & inspector
19. Coordinate soil density testing & concrete cylinder testing with inspector retained by Owner
20. Include all concrete inside and on the site indicated on Site-Civil dwgs
21. Note – final pier size and anchor bolt size/layout will need to be confirmed with the approved pre-engineered metal building drawings – bid per plans, build per approved shop dwgs
22. Anchor Bolts must be installed with rigid templates into pier and NOT "wet –set"

Bid Package Exclusions:

1. Concrete testing (By Owner)
2. Excavation/backfilling of footings (BP-01)
3. Supply of rigid insulation at bldg perimeter (BP-01)
4. Supply of steel bollard posts (BP-03)
5. 24"x15'x250' concrete pad at Rail Yard Siding (By Owner)

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. Sika UltraCure NCF & all associated labor for (7) day cure on all interior concrete slabs

Bid Package #3 (BP-03) General Trades (No Bid – Negotiated)

Bid Package Inclusions:

1. All wood framing including but not limited to: wood blocking, FRT blocking/plates for doors, OH doors, louver openings and windows, specialties, casework, etc. – note ALL wood shall be FRT (Fire Retardant Treated)
2. Pump House (A18): Wall framing, trusses, sheathing, doors, water barrier/siding, roofing membrane/shingles, insulation (wall & roof), exterior/interior trim, interior plywood, attic access,
3. Plywood on walls in Mechanical Room (up to 10' AFF) & Relay Lab
4. ALL hollow metal frames/doors (incl pocket door)/HW/thresholds, spray foam insulation, fire ratings on doors/frames, rubber door silencers & glass for door lights – coordinate getting security wiring into frames
5. FRP (Fiber Reinforced Plastic) system complete, Toilet Rooms, under counter, mop sink, etc
6. Vinyl windows, flashing, trims & spray foam insulation as indicated including air sealing-backer rod around rough opngs
7. Window blinds as indicated
8. Electric strikes, power supplies, etc as noted in HW schedule – work with Data-Security contractor to coordinate getting wiring pulled into door/window frames as required.
9. Furnish all necessary adhesives, fasteners, hangers, etc. associated with this Bid Package
10. All specialties: interior BF signage noted, TP dispensers, towel dispensers, towel bars, fire extinguishers and cabinets, corner guards, waste receptacles, grab bars, toilet partitions, urinal screens, lockers, mirrors, clothes hooks, ice maker stand, bollard covers, etc
11. Joint sealant – exterior side of window/door frames & interior base of Eqpt Bay siding (unless noted to be provided by others)
12. All anchors, hardware, etc to provide all work in this bid package
13. Furnish steel bollard posts (near bldg, wells, generator/septic tank area), galvanized trench drain frames & grating to BP-02 for installation – shop dwgs must also be including by this contractor
14. Provide & install ISOFR grating at Spill Containment and galvanized grating at Trench Drains
15. Security Fence (Hamberg)
16. Epoxy Flooring
17. Rubber seals under OH doors
18. Domestic well & Fire Suppression Re-Fill well

Bid Package Exclusions:

1. Metal stud walls (BP-06)
2. Canopy structures (BP-04)
3. Appliances (By Owner)

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. Provide hourly rate for Carpenter & Laborer for miscellaneous added work
2. Provide Material cost markup percentage

Bid Package #4 (BP-04) Pre-Engineered Metal Building

Bid Package Inclusions:

1. The pre-engineered metal building (PEMB) shall be a complete and engineered building and sealed by a licensed professional in the state of Michigan
2. Supply and erect primary steel framing, secondary steel framing, overhangs, girts, base channel & sill seal, purlins, canopies (complete including columns, framing, plywood, shingles, flashing, etc.), bolted connections, welded connections, ALL exterior wall and roof insulation (batt, rigid & expanding foam as noted), 3" joint sealant tape on rigid insulation, self-adhered underlayment on top of rigid roof insulation (entire roof), include insulation in headers, standing seam roofing panel, ridge cap, flashings, self-adhering membrane flashing wrap, fascia/rakes, drip edge, soffit panel (including under canopies), siding panel, exterior opng trims, corners, base flashing, interior liner panel-walls & ceiling (including above office area) and flat stock above OH door opngs
3. Include portal frames (not X-B) to resist lateral loads, portal frame indicated on floor plan btwn column line 4 & 5
4. Leave NO raw edges of liner or siding panel – close off with J-channel or trim in all cases for clean appearance
5. Coordinate ALL rough openings with doors and windows
6. Snow guarding (pipe and pad type) – must be designed by manufacturer
7. Supply only anchor bolts to BP-02
8. Building shall be designed to be expandable on BOTH ends, at column line "1" & "13"
9. Include cost of crane to erect this building as the concrete slab will be installed PRIOR to bldg delivery & cannot be driven on

Bid Package Exclusions:

1. Windows and doors – will be provided by others – framing and trimming the opngs ARE included
2. Light gauge metal framing on interior side of exterior walls (BP-06)
3. Joint sealant at base of interior liner panel

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. Full crimping of standing seam roof panels

Bid Package #05 (BP-05) **Sectional OH Doors**

Bid Package Inclusions:

1. Insulated, aluminum skin sectional overhead door, lights, operator, transmitter (1 per door), push button stations, track, spring, weather-stripping, photo cells (sensors)/wiring/connections and all associated HW – NOTE some operators are center mount to avoid interferences w/ eqpt @ jambs
2. Note slanted configuration of OH door tracks, they are NOT horizontal – reference dwg A7/A8
3. Shop drawings shall indicate blocking and plating requirements on wall that are required to be installed by BP-03
4. Vehicle exhaust ports in some doors

Bid Package Exclusions:

1. FRT wood blocking/plates

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. NA

Bid Package #06 (BP-06) Gypsum Board–Light Gauge Framing-Ceiling

Bid Package Inclusions:

1. Metal stud walls, headers/jambs, bulkheads, box outs for columns, hat channel on walls, deflection clips/track, acoustical wall insulation, furring & gypsum board, window returns, hard lid framing and gypsum board ceilings
2. Moisture resistant gypsum board at Toilet & Shower Rooms
3. Sub framing above office area ceiling for support of SAC (see dwg A6)
4. Furred exterior wall for plumbing
5. Tall walls outside of center office to underside of roof deck including top of wall detail 8/A13
6. Gypsum board control joints detail 14/A12 – also see specification
7. Utilize 20 gauge (MIN-UNO) stud for all window & door openings at interior walls
8. Top of wall fireproofing, fire safing, ratings as noted
9. Verify metal building roof deflections can be accommodated with deflection track/clips noted for interior, non-bearing walls
10. All clips, fasteners & hardware for your work
11. Drywall finish to the level specified
12. Suspended Acoustical Ceiling systems – note thicker than typical ceiling panels
13. Hat channel framing at interior side of exterior wall at office area
14. Wall strapping on Wall Type “C” in Eqpt Bays
15. All vinyl wall base as noted – note, no pre-made inside or outside corners
16. Completely cover all floors prior to drywall work – remove and clean drywall compound when completed with sanding
17. Acoustical insulation & bottom of wall joint sealant meeting STC levels noted

Bid Package Exclusions:

1. NA

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. NA

Bid Package #07 (BP-07) Painting

Bid Package Inclusions:

1. Provide joint sealant around all door frames (interior side), window frames (interior side), dissimilar material intersections and accessories/specialties as required prior to painting
2. Prime and paint all walls/ceilings, bulkheads, doors/frames, canopy columns as specified
3. Paint (and touch up primer) for steel columns and frames that are not enclosed by interior liner panel. See architectural floor plan and bldg sections for these columns and frames.
4. This contractor is responsible for removing or protecting all mechanical, electrical and architectural trim and cover plates during finishing. Replace all items removed.
5. Include interior & exteiror painting of Pump House (A18)
6. Final touch-up prior to owner occupancy

Bid Package Exclusions:

1. Hardener/sealer on concrete floors (BP-02)

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. NA

Bid Package #08 (BP-08) Casework-Counters

Bid Package Inclusions:

1. Provide all Plastic Laminate base & wall cabinets, benches, fillers, countertops, back splashes, side splashes and hardware/brackets/supports as required
2. Include butcher block surface (9/A14) in Relay Lab 105
3. Include all PLAM window sills
4. Provide joint sealants for all cabinets, countertops & sills adjacent to walls.
5. Include cutouts for sink as indicted
6. Include all blocking locations on shop drawings for General Trades contractor
7. Include holes and grommets and meeting with Owner to determine locations
8. Coordinate appliance and fixture sizes with CM
9. Clean & vacuum work area after installation

Bid Package Exclusions:

1. NA

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. NA

Bid Package #09 (BP-09) Fire Suppression

Bid Package Inclusions:

1. Complete Design Build fire suppression system including sealed design and professional liability insurance certificate & permitting
2. 30,000 gallon Xerxes single wall FRP fire suppression pressure tank complete (excavation, ballast, risers, fittings, piping, connections, etc.) and coordination with CM/Concrete/General Trades contractors constructing Pump House directly over buried tank (ref C4.1 & C5.4)
3. Fire suppression service line from Pump House to Service Center building, including PIV
4. Provide all required: Riser assembly, piping, fittings, valves, trim, riser, and sprinkler heads to provide system as specified. Include all uni-strut, hangers and fastening devices.
5. Piping shall NOT penetrate structural members. Any modification of steel framing shall be approved by the engineer prior. Piping shall be surface mounted under liner panel in Equipment Bays and concealed above ceiling tile in center office area
6. Provide permit as required
7. Notify construction manager regarding any code compliance issues conflicting with drawings prior to bidding
8. Fire department connection at building wall & coordination with PIV
9. Penetration sealing – see note 20 under “General Project Requirements”
10. Coordination with fire alarm contractor to be sure all systems function properly
11. Seal all penetrations through walls and fire walls that this Bid Package creates
12. Coordinate sprinkler head locations with architectural, mechanical, plumbing and electrical plans

Bid Package Exclusions:

1. Tank Refill Well

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. NA

Bid Package #10 (BP-10) Plumbing/HVAC

Bid Package Inclusions:

1. Provide plumbing/mechanical permits as required
2. Notify construction manager regarding any code compliance issues conflicting with drawings prior to bidding
3. Perform all excavation, backfill and compaction required to install underground work in this Bid Package
4. Complete Mechanical system: Infrared tube heaters, unit heaters, exhaust fans with matching color weather hoods, ducting/insulation, dampers, condensers, dryer venting, furnaces, economizer, exterior wall louvers, wall caps, diffuser/grille, regulator valves, gas monitoring systems (complete), pipe insulation, etc. including any necessary rough-in materials/wall penetrations noted underground
5. Complete Plumbing system: Air lines, air reels, water lines, water/hose reels, gas piping (above ground and underground), H/C water piping + returns, hot water heaters, valves, controls, fixtures, pumps, sinks, faucets, water closets, urinals, mop sink, utility sink, eye wash stations, washer box, electric water coolers, wash fountain, hose bibs, shower assembly complete(grab bars/sprays/controls/folding seat/valves/soap dish/leveling compound at floor/curtain & rod/drain), floor drains, drains & piping, venting, cleanouts, ice maker valve box, pipe insulation, backflow preventer
6. **Note-shower unit MUST be installed plumb and level so that water drains and DOES NOT pond
7. Stub out and cap sanitary north and south walls
8. Shelves/brackets/hangers for suspended equipment – verify support as the roof is very high
9. Controls and low voltage wiring for all equipment included in this package
10. Air/water balancing
11. Access doors as noted
12. Penetration sealing – see note 20 under “General Project Requirements”
13. Equipment isolators
14. Provide counter cutout template for sinks to BP-08
15. Pipe insulation/covers (lavatory guards)under sinks
16. Trench drain plumbing & piping to 5’ outside bldg
17. Responsible to take all utility piping (except domestic water) to 5’ outside building for site work contractor to pick up
18. Include clean outs and riser noted on C4.1
19. Final cleaning of ALL equipment in Mechanical/Electrical Room(s)

Bid Package Exclusions:

1. Appliances (By Owner)
2. Water well, tank, softener & service will be stubbed into bldg (By Owner)
3. Air Compressor will be purchased by Owner and installed by this contractor (incl’s all connections)
4. Concrete housekeeping pads for Mechanical equipment (By Owner if req’d)

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. NA

Bid Package #10 (BP-11) Electrical

Bid Package Inclusions:

1. Perform all excavation, backfill and compaction required to install underground work in this Bid Package – Main Service Center, Pump House & Rail Way Siding
2. Provide electrical permit as required
3. Coordinate new electrical service with power company
4. Provide temporary electrical and lighting per specification section 01 15 00 as required for all construction trades for the duration of the project – include connecting CM trailer to power supply
5. Complete Electrical system: Fixtures, panels, lighting, exterior wall lights, breakers, distribution, metering, sensors, transfer switches/switches, dimmers, controls, devices, floor boxes, conduit, outlets, switching, relays, timers, emergency/exit, communications grounding bar, electric strike provisions, low voltage outlets, card reader provisions, camera outlet provisions, OH door provisions, lighting-signs, wiring of mechanical equipment, grounding + bond to foundation (coordinate with concrete contractor)
6. Complete generator system
7. Complete Fire Alarm System: Panel, remote annunciator, pull stations, devices, switches and tie in to fire suppression system & coordination work with PIV
8. FRT plywood back boards as required
9. TV outlets
10. Notify construction manager regarding any code compliance issues conflicting with drawings prior to bidding
11. Penetration sealing – see note 20 under "General Project Requirements"
12. Site electrical: ALL UG conduit, receptacles, panels (incl unistrut racks), pull strings, pull boxes, junctions, sweeps (see site plans also), base & conduit, lights/conc bases, timers, well pump & concrete bases – see SE1, SE2 & civil plans – power, power to gates, control panel-alarm wiring/pedestal/receptacle & connections for trench drain tank system (coord with BP-01)
13. Label backside of faceplates
14. Include all conduit, sleeving, pull strings & boxes for data and low-voltage work (security, cameras, video, etc
15. Conduit-boxes can be surface mounted in the Equipment Bays and Mechanical Room as noted on E1P
16. Final cleaning of ALL equipment in Mechanical/Electrical Room(s)

Bid Package Exclusions:

1. Low voltage wiring for Mechanical system (BP-10)
2. Low voltage wiring for Data-Security
3. Site concrete pads (BP-02)
4. Under driveway sleeves (BP-01)
5. TV's, Security, data, camera devices/wiring (By Owner) – just conduit/boxes to be included
6. Appliances (By Owner)
7. Cable tray (By Owner)
8. Interior concrete housekeeping pads for Electrical equipment (By Owner if req'd)

Consideration for award:

All mandatory Alternates will be considered for award. The ability to meet the project schedule requirements by starting work immediately after it becomes available. To employ supervision, skilled workmen and equipment to complete the work described in the documents. Provide input along with the CM and other bid packages to create a working schedule. Expedite communication and follow-up as required.

Mandatory Alternate(s):

1. 5-year generator maintenance agreement (see Electrical dwgs)
2. ADD Alternate for all electrical work @ Rail Yard Siding (ref break line on Dwg SE2) **Note, some of this work is By Owner and this contractor will provide the cost for the REMAINING WORK**

End of Section

SECTION 00 31 00
INFORMATION AVAILABLE TO BIDDERS

1.01 GENERAL

A. Information made available to Bidders is provided for the convenience of the Bidders and does not form a part of the Construction Documents nor the Contract for Construction.

1. Use of information made available to Bidders does not relieve the Bidder from doing its own independent research and assessment of existing conditions.

B. The use and interpretation of this information is entirely the responsibility of the using party.

1. It is the Bidder's responsibility to verify the accuracy of information available to Bidders.
2. Bidders shall draw conclusions for themselves as to the requirements for construction inferable from this information.
3. To the extent that actual conditions are observable during the Bidding phase, the Owner is not responsible for variations in the actual site conditions encountered in the Contractor's execution of the Work.

1.02 SITE INFORMATION

A. The following site information is made available for the convenience of the Bidders.

1. "GEOTECHNICAL INVESTIGATION REPORT: Wolverine Power Service Center, Elmira, Michigan" dated January 2019, produced by Otwell Mawby Geotechnical, P.C., Consulting Engineers, Traverse City, MI.

B. The geotechnical analysis and report cannot reveal all conditions that exist on the site.

1. If subsurface conditions are found to differ materially and substantially from those described in the geotechnical report, design changes may be made as approved by the Architect and engineer, and any resulting changes to the Contract Sum or Time, as agreed to between the Owner and the Contractor, will be established in a Change Order.

END OF SECTION

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GEOTECHNICAL INVESTIGATION REPORT

Wolverine Power Service Center
Elmira, Michigan

January 2019

Prepared For:

Apex Engineering and Management
3409 Veterans Drive
Traverse City, Michigan 49684

Prepared By:

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PN: G18-266

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Geotechnical Investigation Report
Wolverine Power Service Center
Elmira, Michigan

December 2018

1.0 INTRODUCTION

A geotechnical investigation has been completed for the proposed Wolverine Power Service Center building in Elmira, Michigan. The investigation included site reconnaissance, subsurface exploration consisting of test drilling, evaluation of the encountered conditions, and preparation of this report. The investigation was performed for Apex Engineering and Management in accordance with our proposal dated December 6, 2018.

The investigation generally encountered *poorly graded sand* or *poorly graded sand with silt* in the building area. The site may have been cultivated and should be expected to have topsoil inclusions within the upper several feet. Conventional subgrade preparation is expected to be adequate for building construction except that relatively heavy equipment should be used to compact foundation subgrade.

2.0 TYPE OF CONSTRUCTION

We have been provided a site plan dated December 13, 2018 indicating the proposed building location and site improvements. The project will include a proposed building, approximately 20,500 sf in plan, surrounding parking area, gravel service drive, and pole storage area. Traffic will consist of passenger vehicles, light trucks, and heavier axle loads from service vehicles.

TÜe building's structural frame will be of steel construction witÜ a metal exterior. Interior framing is expected to relatively lightly loaded (cold formed steel). We have considered maximum column loads of 50 kips and maximum wall loads of 3 kips/ft.

Existing grades in the building area range from approximately 1240 to 1244 ft. It is considered that the proposed building elevation will be within 3 ft of existing grade. We should be informed of any changes from these design considerations as they may affect our recommendations.

3.0 FIELD INVESTIGATION

The field investigation was completed on December 7, 2018 and included a series of six soil borings. Borings were performed at locations indicated on Figure No. 1, Site Location Map, attached in Appendix A. Boring locations were staked by our personnel in the field. The ground surface elevations were approximated based on elevations on the referenced plan. A registered Land Surveyor should locate the borings if more accurate boring location or elevation information is desired.

The borings were advanced to depths of 10 to 20 ft using an ATV-mounted CME 750X drill rig equipped with 4 ¼ inch inside diameter, continuous flight, hollow stem augers. Samples were obtained by means of the Standard Penetration Test, ASTM D 1586, and continuous logs of the borings were recorded. Observations were made in the field regarding drilling difficulty, groundwater conditions, etc. as the drilling progressed. Soil samples were classified in accordance with the Unified Soil Classification System (Visual-manual procedure, ASTM D 2488) and boring logs were prepared which graphically depict the subsurface soils encountered. The details of the soils encountered in the investigation can be found on the boring logs attached in Appendix B.

An additional field investigation was completed on December 27, 2018 and included a series of 16 soil borings. Borings were performed at locations indicated on Figure No. 1, Site Location Map, attached in Appendix A. Borings were advanced manually with a 3 ¼ inch diameter barrel soil auger, to an approximate deptÜ of 12 below bottom of topsoil. TÜese borings were performed to determine thickness of topsoil throughout the project site.

Soil borings were performed solely for the purpose of a geotechnical investigation. Environmental services are not included in the geotechnical scope of service.

4.0 SITE AND SUBSURFACE CONDITIONS

The site is primarily open (likely former agricultural) and grass covered, with multiple windbreaks or stands of primarily evergreen trees. The southwest portion of the site was more densely wooded, bordering ATV trails. The site has been developed along Ray Street with

multiple residential or accessory buildings present. Outdoor storage/debris is present at multiple locations. A rail line including a siding is present on the south border of the site.

The site topography was rolling with steeper terrain present in the southwest portion of the site. Ground surface elevations ranged from approximately 1187 to 1245 ft.

The proposed building site area has likely been cultivated and topsoil inclusions may be present in the upper several feet. Sand was typically present beneath the surface classified as *poorly graded sand* (Unified Soil Classification System Group Symbol SP) or *poorly graded sand with silt* (Unified Soil Classification System group symbol SP-SM). The upper sand was typically very loose to loose in relative density based on the recorded Standard Penetration Test N-values. *Poorly graded sand with gravel* (SP) was present below the upper sand in Boring B-4 and B-5. The lower sand was medium dense. Boring B-6 had *silty sand with gravel* below the upper sand at a depth of 5 to 7 ft., with *poorly graded sand with gravel* (SP) below. The *silty sand* was loose in density. Groundwater was not encountered in the borings within the building site area.

Boring B-1, within the proposed pole storage area, had approximately 2 inches of topsoil underlain by *poorly graded sand with silt*. The sand was typically medium dense in relative density. The upper sand is underlain by *poorly graded sand* at a depth starting at approximately 11 ft. The lower sand is loose to medium dense. Groundwater was encountered at a depth of approximately 14.5 ft. Groundwater was recorded based on observation of the recovered samples and of the boreholes after auger removal. Groundwater levels will vary due to precipitation, infiltration, etc. and may be different at the time of construction.

Borings B-2 and B-3, along tÜe proposed 30' wide drive, typically had 5 to 6 inches of topsoil underlain by *poorly graded sand* or *silty sand*. The sand was very loose to loose. *Poorly graded sand with gravel* extended below the upper sand from a depth of 5 to 7 ft. The lower sand was typically medium dense.

The sand present in the borings graded frequently with trace to some coarse gravel and the sample recovery in the split-spoon samples was occasionally low. Based on this evidence, it

should be expected that coarse gravel, cobble and possible boulders are present and will be encountered during excavation.

Topsoil thickness was variable at the site and additional Borings TS-101 to TS-116 were completed. The topsoil thickness at the additional locations ranged from 9 to 32 inches. The topsoil was typically dark brown to black and generally sandy. Table 4.1 below details the topsoil thickness for each boring location.

Table 4.1 – Topsoil Thickness

Boring	Depth of Topsoil (inches)
TS-101	10
TS-102	10
TS-103	11
TS-104	13
TS-105	11
TS-106	9
TS-107	11
TS-108	14
TS-109	8
TS-110	9
TS-111	29
TS-112	32
TS-113	26
TS-114	13
TS-115	32
TS-116	7

This section has included a general description of the subsurface and groundwater conditions. The boring logs attached in Appendix B should be reviewed for additional detail. The described conditions are based on a limited number of test borings and samples. Variations from these locations should be expected.

5.0 ENGINEERING ANALYSIS

5.1 Shallow Foundation System

A conventional spread and continuous shallow foundation system is recommended for support of the proposed building. The following design parameters are recommended for foundation design:

Table 5.1.1 – Foundation Design Parameters

Minimum Width of Square or Rectangular Foundations, inches	24
Minimum Width of Continuous Foundations, inches	18
Maximum Net Allowable Foundation Bearing Capacity, psf	2500
Minimum Embedment Depth for Frost Protection, inches	42

The foundations are expected to bear in the existing sand subgrade or on engineered fill. Subgrade preparation as described in the following section is required based on very loose to loose relative density of the sand.

The recommended maximum net allowable bearing capacity is based on a factor of safety greater than 3.0 and anticipated settlement of less than 1 inch.

5.2 Site and Subgrade Preparation

Site preparation should include the removal of all vegetation, topsoil, etc. within the construction area. The site has been cultivated and a relatively thick topsoil/disturbed layer may be present.

Prior to placement of structures or engineered fill, the entire construction area should be compacted by the contractor. Due to very loose to loose conditions, this compaction should be completed with relatively heavy vibratory compaction equipment such as a vibratory roller, hoe-pack, or larger (>500 lbs.) reversible type plate compactor. A conventional, walk behind plate compactor will not be acceptable. At a minimum, the upper 12 inches should be compacted to a minimum of 95% of tÜe material' s MDOT MicÜgan Cone maximum density.

Due to the variability of the subsurface conditions, subgrade verification should be completed by qualified geotechnical personnel familiar with these recommendations at each bearing element. The subgrade verification should include the use of a dynamic cone penetrometer and nuclear density testing in granular soils.

Engineered fill is controlled material placed in lifts under the observation of the geotechnical engineer. The on-site soil, classified as *poorly graded sand* (SP) or *poorly graded sand with silt* (SP-SM), is expected to be suitable for use as engineered fill provided it is free of topsoil, vegetation, cobble or boulder (material greater than 3 inch diameter), or other deleterious material. Gravel was frequently present in the on-site material and occasional cobble/boulder may be present. Screening or selective use of material is expected to be needed if on-site soil will be used as engineered fill. Occasional cobble (3 to 10 inch diameter) material may be included in fill placed for site grading provided that suitable compaction equipment and effort is provided, but not within 2 ft of the surface in pavement or sidewalk locations.

Imported material should meet the requirements for MDOT Class II sand.

Engineered fill should be compacted to a minimum of 95 percent of its MDOT Michigan cone maximum density. Engineered fill should be compacted in lifts of 12 inches or less and a program of inspection, testing, and documentation of the engineered fill should be implemented.

Construction with frozen soil should not occur.

5.3 Floor Slabs

Subgrade preparation for floor slabs should be completed as described in the Site and Subgrade Preparation section of this report. A minimum of 12 inches of MDOT Class II sand should be placed beneath the floor slab; however, the on-site material classified as *poorly graded sand* (SP) or *poorly graded sand with silt* (SP-SM) it is expected to be acceptable provided that it is free of vegetation, cobble or boulder, or other deleterious material. A modulus of subgrade reaction, k_{30}, of 100 pci is recommended for design of floor slabs. If the floor slab will have a moisture

sensitive covering or be within a moisture controlled area, a vapor barrier should be provided as recommended in ACI 302.1R *Guide for Concrete Floor and Slab Construction*.

We have considered that the floor slab will be at or above the corresponding exterior grade. We should be informed if the slab will be below the corresponding exterior grade as a perimeter foundation drain system may be recommended.

5.4 Groundwater

Groundwater was encountered in the boring at the proposed storage area at a depth of approximately 14.5 ft but was not present within the explored depth of the other borings. Groundwater levels will vary depending on snowmelt, infiltration, precipitation and other factors and may be different at the time of construction. Generally, though, groundwater levels are not expected to be a concern for building or site construction.

6.0 LIMITATIONS

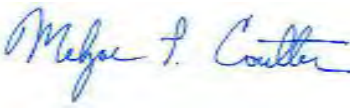
The evaluations and recommendations presented in this report have been developed on the basis of available data relating to the locations, type, and finished elevations for the proposed development. Any changes in this data, deviations from encountered conditions, or the final design plans should be brought to our attention for review and evaluation with respect to our geotechnical recommendations. Variations in the soil conditions between existing borings are possible and such variations may not become evident until construction occurs and we recommend that we be retained during construction to provide subgrade verification. If changes occur to the location, configurations or structural plans or if construction reveals differences in the soil conditions from those observed in our investigation and utilized in our analyses, we request the opportunity to review and if necessary, revise our recommendations.

7.0 CLOSURE

We appreciate the opportunity to have provided geotechnical services for the Wolverine Power Elmira Service Center and express our interest in providing subgrade verification and materials testing services during construction. We should be contacted if any questions arise regarding the recommendations provided herein.

Very truly yours,

OTWELL MAWBY GEOTECHNICAL, P.C.



Melzar L. Coulter, P.E.
Sr. Geotechnical Engineer

Roger L. Mawby, P.E.
President

MLC/RLM/mc

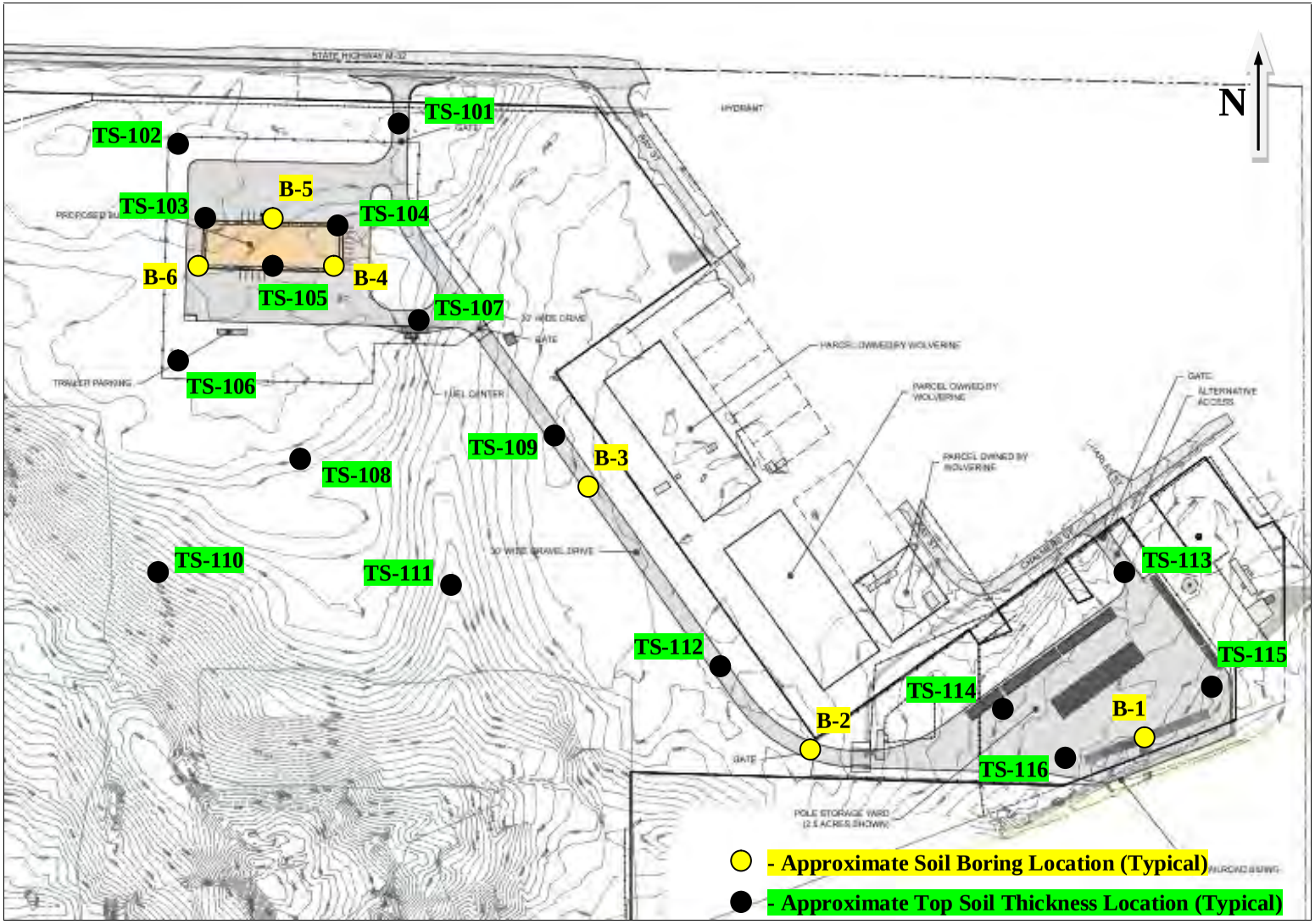
APPENDICES

Appendix A - Site Plan

Appendix B - Boring Logs

Appendix A

Site Plan



Wolverine Power Elmira Service Center **Elmira Township, Michigan**	**Figure 1: Site Location Map**		
Otwell Mawby Geotechnical, PC **Traverse City, Michigan**	**Project No:** **G18-266**	**Date:** **1/11/19**	**Source:** **Jozwiak Consulting**

Appendix B

Boring Logs

Client: Apex
Project: Wolverine Power Service Center G18-266
Location: Elmira, MI

Boring Log Of: B-1
Date Drilled: December 7, 2018
Drilling Contractor: Pearson
Page 1 of 1

Std. Penetration Resistance (N)	Recovery	Sample Method	Sample Type/Interval	Depth (feet)	Soil Type	Soil Description	Pocket Penetrometer (TSF)	Comments
						Surface Conditions: Sand		
						2" Topsoil		
4, 5, 5, 4	6"	SS				Poorly-graded SAND with silt and gravel; mostly fine to coarse sand; round to subrounded gravel; tan/brown; moist to dry (SP-SM)		Boring advanced with an CME 750X ATV-mounted drill rig equiped with 4.25" inner diameter hollow stem augers.
6, 7, 5, 6	0"	SS		5				Poor or no sample recovery and coarse gravel observed during drilling. Possible cobble/boulder.
9, 10, 9, 9	11"	SS				grades with trace silt (SP)		
5, 6, 8, 8	0"	SS		10				
						Poorly-graded SAND; mostly fine to medium sand; trace fine gravel; brown; moist (SP)		
2, 4, 5, 8	16"	SS		15		-grades with trace silt, wet	▽	
						End of Boring 15'		
				20				
				25				
				30				

Well Construction / Boring Data

Top of Casing : N/A
Ground Elev.: N/A
Casing: N/A
Screen: N/A

Water Encountered: 14.5' +/-
Date: 12/7/2018
Logging Method: Visual-Manual
Development Method: N/A

Driller: JS
Helper: BP
Logged By: RW

Otwell Mawby, P.C.
309 E. Front Street
Traverse City, MI 49684
231-946-5200
Fax 231-946-5216

Client: Apex
Project: Wolverine Power Service Center G18-266
Location: Elmira, MI

Boring Log Of: B-2
Date Drilled: December 7, 2018
Drilling Contractor: Pearson
Page 1 of 1

Std. Penetration Resistance (N)	Recovery	Sample Method / Sample Type/Interval	Depth (feet)	Soil Type	Soil Description	Pocket Penetrometer (TSF)	Comments
					Surface Conditions: Sand		
2, 2, 1, 2	16"	SS			6" Topsoil Silty SAND; mostly medium sand; dark brown; moist (SM)		Possible tilled material upper 3 ft. +/-
1, 2, 4, 7	7"	SS	5		Poorly graded SAND; mostly medium to fine sand; trace clay; tan/brown mottled; moist (SP)		Poor sample recovery and coarse gravel observed during drilling. Possible cobble/boulder.
2, 10, 18, 15	6"	SS			Poorly graded SAND with gravel; mostly medium to fine sand; some fine to coarse gravel; tan; moist (SP)		
16, 13, 7, 5	7"	SS	10		End of Boring 10'		Boring advanced with an CME 750X ATV-mounted drill rig equiped with 4.25" inner diameter hollow stem augers.
			15				
			20				
			25				
			30				

Well Construction / Boring Data

Top of Casing : N/A
Ground Elev.: N/A
Casing: N/A
Screen: N/A

Water Encountered: N/A
Date: 12/7/2018
Logging Method: Visual-Manual
Development Method: N/A

Driller: JS
Helper: BP
Logged By: RW

Otwell Mawby, P.C.
309 E. Front Street
Traverse City, MI 49684
231-946-5200
Fax 231-946-5216

Client: Apex
Project: Wolverine Power Service Center G18-266
Location: Elmira, MI

Boring Log Of: B-3
Date Drilled: December 7, 2018
Drilling Contractor: Pearson
Page 1 of 1

Std. Penetration Resistance (N)	Recovery	Sample Method	Sample Type/Interval	Depth (feet)	Soil Type	Soil Description	Pocket Penetrometer (TSF)	Comments
						Surface Conditions: Sand		
						5" Topsoil		Boring advanced with an CME 750X ATV-mounted drill rig equiped with 4.25" inner diameter hollow stem augers.
3, 4, 2, 2	7"	SS				Poorly graded SAND; mostly medium to fine sand; trace gravel; tan to brown; moist (SP)		
2, 3, 4, 2	1"	SS		5				Poor sample recovery and coarse gravel observed during drilling. Possible cobble/boulder.
1/12", 2, 1	4"	SS				Poorly graded SAND with gravel; mostly medium to coarse sand; some fine to coarse gravel; tan to brown; moist (SP)		
5, 7, 11, 11	5"	SS				-grades tan with trace gravel		
				10		End of Boring 10'		
				15				
				20				
				25				
				30				

Well Construction / Boring Data

Top of Casing : N/A
Ground Elev.: N/A
Casing: N/A
Screen: N/A

Water Encountered: N/A
Date: 12/7/2018
Logging Method: Visual-Manual
Development Method: N/A

Driller: JS
Helper: BP
Logged By: RW

Otwell Mawby, P.C.
309 E. Front Street
Traverse City, MI 49684
231-946-5200
Fax 231-946-5216

Client: Apex
Project: Wolverine Power Service Center G18-266
Location: Elmira, MI

Boring Log Of: B-4
Date Drilled: December 7, 2018
Drilling Contractor: Pearson
Page 1 of 1

Std. Penetration Resistance (N)	Recovery	Sample Method	Sample Type/Interval	Depth (feet)	Soil Type	Soil Description	Pocket Penetrometer (TSF)	Comments
						Surface Conditions: Sand		
						10" Topsoil		
1, 2, 2, 3	11"	SS				Poorly graded SAND; mostly medium to fine sand; trace gravel; brown; moist (SP)		Mottled upper 3 ft. +/-; possible tilled material
1, 2, 2, 4	5"	SS		5		Grades with dark brown mottling		Boring advanced with an CME 750X ATV-mounted drill rig equiped with 4.25" inner diameter hollow stem augers.
3, 3, 3, 3	7"	SS						
5, 9, 8, 9	8"	SS		10		Poorly graded SAND with gravel; mostly medium sand; tan; moist (SP)		Poor sample recovery and coarse gravel observed during drilling. Possible cobble/boulder.
2, 5, 6, 12	16"			15		Poorly graded SAND; mostly medium to fine sand; brown; moist (SP)		
						Grades with trace cobble and sandy gravel lenses		
5, 9, 16, 20	16"			20		Poorly graded SAND; mostly fine sand; tan; moist (SP)		
						End of Boring 20'		
				25				
				30				

Well Construction / Boring Data

Top of Casing : N/A
Ground Elev.: N/A
Casing: N/A
Screen: N/A

Water Encountered: N/A
Date: 12/7/2018
Logging Method: Visual-Manual
Development Method: N/A

Driller: JS
Helper: BP
Logged By: RW

Otwell Mawby, P.C.
309 E. Front Street
Traverse City, MI 49684
231-946-5200
Fax 231-946-5216

Client: Apex
Project: Wolverine Power Service Center G18-266
Location: Elmira, MI

Boring Log Of: B-5
Date Drilled: December 7, 2018
Drilling Contractor: Pearson
Page 1 of 1

Std. Penetration Resistance (N)	Recovery	Sample Method	Depth (feet)	Soil Type	Soil Description	Pocket Penetrometer (TSF)	Comments
					Surface Conditions: Sand		
					10" Topsoil		
2, 3, 3, 3	12"	SS			Poorly graded SAND with silt; mostly medium to fine sand; reddish brown; moist (SP-SM)		Boring advanced with an CME 750X ATV-mounted drill rig equiped with 4.25" inner diameter hollow stem augers.
1, 2, 3, 6	4"	SS	5		-grades with trace fine gravel		
3, 9, 12, 14	12"	SS			Poorly graded SAND with gravel; mostly fine to coarse sand; some fine to coarse gravel; angular to subangular gravel; tan; moist (SP)		Poor sample recovery and coarse gravel observed during drilling. Possible cobble/boulder.
9, 11, 15, 13	12"	SS	10				
3, 4, 5, 6	15"				Poorly graded SAND with gravel; mostly medium to coarse sand; tan; moist (SP)		
			15		Poorly graded SAND; mostly fine to medium sand; trace gravel; tan; moist (SP)		
6, 5, 15, 23	15"				-grades with trace cobble		
			20		End of Boring 20'		
			25				
			30				

Well Construction / Boring Data

Top of Casing : N/A
Ground Elev.: N/A
Casing: N/A
Screen: N/A

Water Encountered: N/A
Date: 12/7/2018
Logging Method: Visual-Manual
Development Method: N/A

Driller: JS
Helper: BP
Logged By: RW

Otwell Mawby, P.C.
309 E. Front Street
Traverse City, MI 49684
231-946-5200
Fax 231-946-5216

Client: Apex
Project: Wolverine Power Service Center G18-266
Location: Elmira, MI

Boring Log Of: B-6
Date Drilled: December 7, 2018
Drilling Contractor: Pearson
Page 1 of 1

Std. Penetration Resistance (N)	Recovery	Sample Method	Sample Type/Interval	Depth (feet)	Soil Type	Soil Description	Pocket Penetrometer (TSF)	Comments
						Surface Conditions: Sand		
						10" Topsoil		
2, 2, 2, 2	16"	SS				Poorly graded SAND with silt; mostly medium to fine sand; reddish brown; moist (SP-SM)		Boring advanced with an CME 750X ATV-mounted drill rig equiped with 4.25" inner diameter hollow stem augers.
1, 1, 2, 2	13"	SS		5		Silty SAND with gravel; mostly medium sand; dark reddish brown; moist (SM)		
5, 5, 6, 9	6"	SS				Poorly graded SAND with gravel; mostly fine to coarse sand; some gravel; brown; moist (SP/GP)		Poor sample recovery and coarse gravel observed during drilling. Possible cobble/boulder.
4, 7, 7, 9	9"	SS		10				
8, 8, 6, 7	12"			15		Poorly graded SAND; mostly medium sand; trace fine gravel; tan; moist (SP)		
3, 5, 11, 12	14"			20		Poorly graded SAND with gravel (SP)		
						End of Boring 20'		
				25				
				30				

Well Construction / Boring Data

Top of Casing : N/A
Ground Elev.: N/A
Casing: N/A
Screen: N/A

Water Encountered: N/A
Date: 12/7/2018
Logging Method: Visual-Manual
Development Method: N/A

Driller: JS
Helper: BP
Logged By: RW

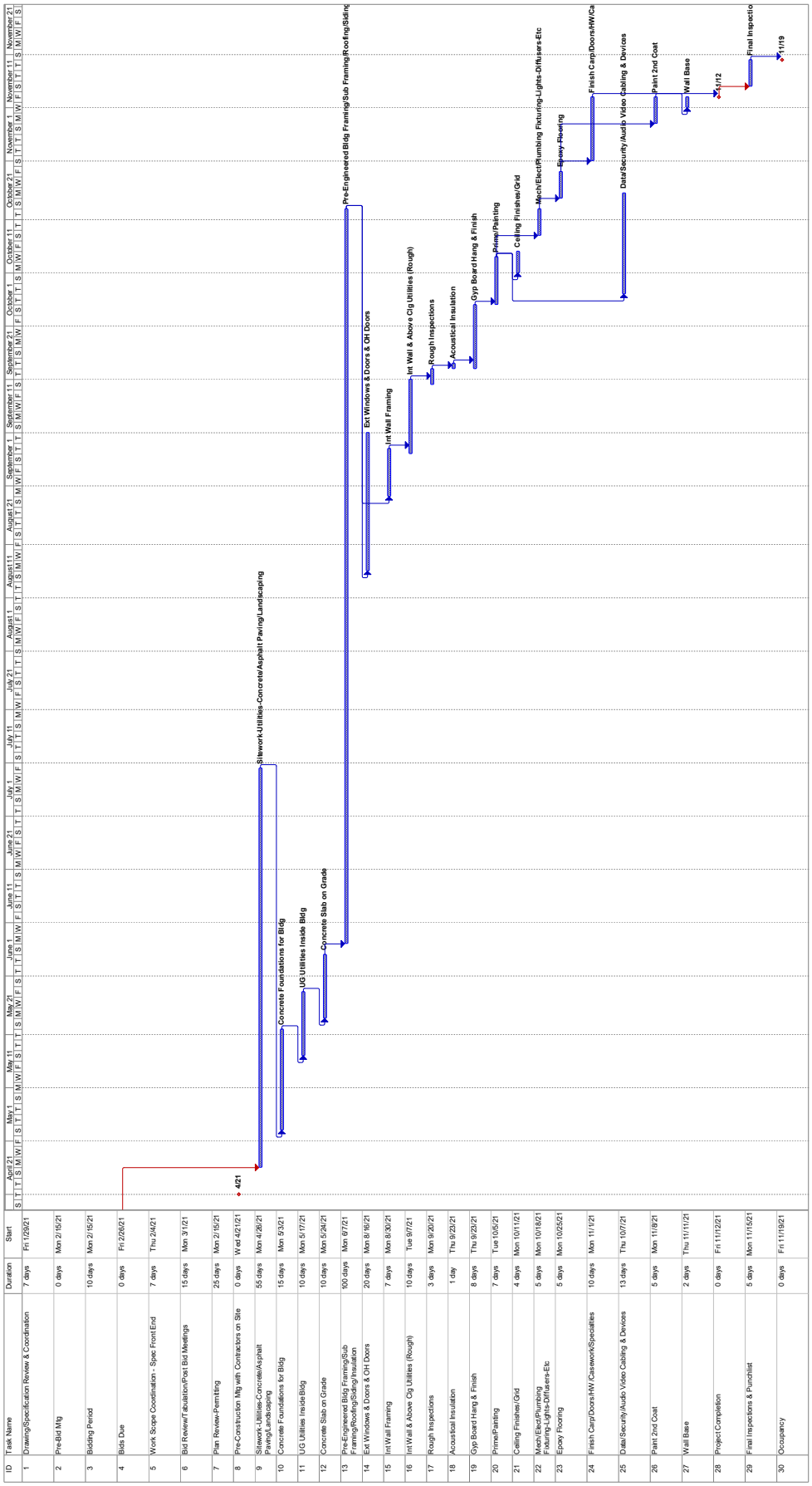
Otwell Mawby, P.C.
309 E. Front Street
Traverse City, MI 49684
231-946-5200
Fax 231-946-5216

Project Schedule

Wolverine Power Cooperative
Elmira Service Center

APEX ENGINEERING & MANAGEMENT, INC.

ID	Task Name	Duration	Start
1	Drawing/Specification Review & Coordination	7 days	Fri 1/29/21
2	Pre-Bid Mtg	0 days	Mon 2/15/21
3	Bidding Period	10 days	Mon 2/15/21
4	Bids Due	0 days	Fri 2/26/21
5	Work Scope Coordination - Spec Front End	7 days	Thu 2/4/21
6	Bid Review/Tabulation/Post Bid Meetings	15 days	Mon 3/1/21
7	Plan Review-Permitting	25 days	Mon 2/15/21
8	Pre-Construction Mtg with Contractors on Site	0 days	Wed 4/21/21
9	Sitework-Utilities-Concrete/Asphalt Paving/Landscaping	55 days	Mon 4/26/21
10	Concrete Foundations for Bldg	15 days	Mon 5/3/21
11	UG Utilities Inside Bldg	10 days	Mon 5/17/21
12	Concrete Slab on Grade	10 days	Mon 5/24/21
13	Pre-Engineered Bldg Framing/Sub Framing/Roofing/Siding Insulation	100 days	Mon 6/7/21
14	Ext Windows & Doors & OH Doors	20 days	Mon 8/16/21
15	Int Wall Framing	7 days	Mon 8/30/21
16	Int Wall & Above Cig Utilities (Rough)	10 days	Tue 9/7/21
17	Rough Inspections	3 days	Mon 9/20/21
18	Acoustical Insulation	1 day	Thu 9/23/21
19	Gyp Board Hang & Finish	8 days	Thu 9/23/21
20	Prime/Painting	7 days	Tue 10/5/21
21	Ceiling Finishes/Grid	4 days	Mon 10/11/21
22	Mech/Elect/Plumbing Fixturing-Lights-Diffusers-Etc	5 days	Mon 10/18/21
23	Epoxy Flooring	5 days	Mon 10/25/21
24	Finish Carp/Doors/HW Casework/Specialties	10 days	Mon 11/1/21
25	Data/Security/Audio Video Cabling & Devices	13 days	Thu 10/7/21
26	Paint 2nd Coat	5 days	Mon 11/8/21
27	Wall Base	2 days	Thu 11/11/21
28	Project Completion	0 days	Fri 11/12/21
29	Final Inspections & Punchlist	5 days	Mon 11/15/21
30	Occupancy	0 days	Fri 11/19/21



SECTION 00 42 16
PROPOSAL FORM

Project: Wolverine Power Cooperative – Elmira Service Center

Submitted By:_____
(Bidder's Company Name)

Address: _____

City / State / Zip: _____

Phone: _____

Bid Proposal Deadline: Prior to February 26, 2021 at 2:00 PM to:

Deliver to: **Apex Engineering & Mgt**
5101 Sawyer Woods Drive or
Traverse City, MI, 49684

Wolverine Power
W 10125 Watergate Rd
Cadillac, MI 49601

or **Email**
steve@apexem.net

Bid Package # _____ Bid Package Name: _____

BASE BID for Wolverine Power Cooperative – Elmira Service Center

_____ Dollars and 00/100ths

$_____

Provide **ADDED** cost for Labor & Material Bond and Performance Bonds on Base Bid:

_____ Dollars and 00/100ths

$_____

ADDENDA

We (the Bidder) acknowledge receipt of the following Addenda:

Addendum No. _____ Dated: _____

Addendum No. _____ Dated: _____

COMBINED BID DEDUCT

If awarded a contract for the Work, combining the following Bid Division(s), the corresponding amount(s) may be deducted from the Base Bid(s) of each of the involved Bid Packages.

Bid Packages Combined	Deduct from each Bid Package
_____	_____
_____	_____

VOLUNTARY/MANDATORY ALTERNATES (see Scope of Bids)

Summary of Alternate	Amount
_____	_____Add/Deduct
_____	_____Add/Deduct
_____	_____Add/Deduct

SUBMITTALS

Anticipated Date of Shop Drawing Submittal at Post Bid Interview: _____

Anticipated Number of Consecutive Calendar Days to Begin:_____

Anticipated Number of On-site Staff: _____

Anticipated Number of Consecutive Calendar Days to Complete: _____

Anticipated Number of Consecutive Calendar Days for Delivery of Needed Items: _____

Proposed Manufacturers, Suppliers, and/or Subcontractors:

Item(s)	Manufacturer/Subcontractor/Supplier
_____	
_____	

BID PACKAGE RESPONSIBILITY

We recognize that the Scope of Work within a Bid Package represents a construction segment that this is not necessarily restricted to a single construction trade, and our Proposal includes work of all trades required to fully and successfully complete all of the Work required in the Bid Package(s) we have submitted Proposals for.

SCHEDULE

We understand that this project will be constructed in accordance with the Preliminary Project Schedule included and will supply adequate man power and materials to successfully complete the work being bid.

EXCEPTIONS AND/OR SUBSTITUTIONS

We have submitted our Proposal, as specified, complete and in accordance with the Bidding Documents, including Addenda and the Contract Documents, without exceptions or substitutions, unless otherwise noted in the "Voluntary Alternate" portion of this Proposal Form.

EXECUTION

Name of Bidder: _____

Bidder's Status:

__ *Corporation;* __ *Partnership;* ___ *Sole Proprietor;* ___ *Other :(Please Specify :*_____*)*

*By/Signature:*_____

Name:
_____

Title: _____

Date:
_____

Phone: _____ *Fax:* _____

End of Section

SECTION 00 62 76
APPLICATIONS FOR PAYMENT/SWORN STATEMENTS/WAIVERS

APPLICATIONS FOR PAYMENT

1.01 DESCRIPTION

A. One (1) original invoice must be received or mailed to Apex Engineering & Mgt by the 20th of the month or as indicated in the contract. **Projections of work beyond this date will NOT be allowed.** Submit payment applications based on work in place or for stored material through this date and **NOT beyond**.

B. All Applications for Payment will be submitted on "AIA Document G702 – Application and Certificate for Payment."

1.02 SWORN STATEMENTS/WAIVERS

A. Waivers will be distributed to contractors by the CM prior to delivery of payment.

1.03 SCHEDULE OF VALUES

A. All billings are processed on the basis of approved Schedules of Values to be approved before the first Application for Payment. Absolutely NO CHANGES may be made to the approved Schedule of Values.

B. Approved Schedule of Values shall be submitted along with AIA Document G702 – Application and Certificate for Payment, on AIA Document G703 – Continuation Sheet.

1.04 CHANGE ORDERS

A. Increases or decreases in the Contract Amount shall be through Change Orders.

B. Each Change Order shall be listed as a new line item on the G703 – Continuation Sheet.

1.05 APPROVAL OR REJECTION OF APPLICATION FOR PAYMENT

A. Approved Applications for Payment will be submitted to the Owner for their approval and payment. Following approval, the Owner will prepare checks and appropriate waivers and pay contractors.

B. Applications for Payment that are rejected will be returned to the Contractor, accompanied by an explanation, for resubmittal the following billing period.

SWORN STATEMENTS-WAIVERS

1.01 DESCRIPTION

A. Sworn Statement shall be included with each Application for Payment.

B. A sample Sworn Statement follows as Pages 2 and 3 of this Section.

C. Page 1 of the Sworn Statement shall contain all necessary Project information, including:

1. Date of Sworn Statement
2. County in which the deponent is at the time of the completion of the Sworn Statement.
3. Deponent name.
4. Contractor name on whose behalf the deponent is making statement.
5. County in which the Project is situated.
6. Project name and site location.
7. Deponent signature and typewritten name.
8. Notary name, signature, and commission expiration date.

D. Page 2 of the Sworn Statement shall contain all necessary Project information, including:

1. Project name and site location.
2. Subcontractor/Supplier listings as submitted for approval at the beginning of the Project with Schedule of Values.
3. Description of work to be completed by each subcontractor/suppler.
4. Total contract amount for each subcontractor/supplier.
5. Listings of amounts paid, amounts owing, retentions held, and balances to complete.

1.02 WAIVERS

A. Waivers will be supplied to contractor by CM.

Sample Sworn Statement

STATE OF MICHIGAN
COUNTY OF _____

_____ Being duly sworn, deposes and says that _____ Is the Contractor for an improvement to the following described real property situated in _____ COUNTY, MICHIGAN, known as _____. That the following is a statement of each subcontractor and supplier and laborer, for which laborer the payment of wages for fringe benefits and withholdings is due but unpaid, with whom the contractor has subcontracted for performance under the contract with the owner or lessee thereof, and that the amounts due to the persons as of the date hereof are correctly and fully set forth opposite their names, as follows on page 2.

That the contractor has not procured materials from, or subcontracted with, any other person other than those set forth and owes no money for the improvement other than the sums set forth.

Deponent further says that he or she makes the foregoing statement as the contractor for the purpose of representing to the owner or lessee of the above described premises and his or her agents that the above described property is free from claims of construction liens, or the possibility of construction liens, except as specifically set forth and except for claims of Construction Lien Act, Act No. 497 of the Public Acts of 1980, as amended, being Section 570.1109 of the Michigan Complied Laws.

_____
Deponent Signature

_____
Deponent Name – Typewritten

_____ County, Michigan

Subscribed and sworn before me this _____ day of _____, 20_____.

_____
Notary Public Signature

_____
Notary Public Name – Typewritten

My commission expires: _____

Warning to the Owner: an owner or lessee of the above described property may not rely on this sworn statement to avoid the claim of a subcontractor, supplier, or laborer who had provided a notice of furnishing or a laborer who may provide a notice of furnishing pursuant to Section109 of the Construction Lien Act to the designee or the owner of lessee if the designee is not named or has died.

Warning to the deponent: a person, who with intent to defraud, gives a false sworn statement is subject to criminal penalties as provided in Section 110 of the Construction Lien Act, Act No. 497 of the Public Acts of 1980, as amended, being Section 50.1110 of the Michigan Complied Laws.

Page 2 – Sworn Statement Sample

Project Name: Site Location:

SUB/SUPPLIER	DESCRIPTION	TOTAL CONTRACT	AMOUNT PAID	AMOUNT OWING	RETENTION HELD	BALANCE TO COMPLETE

End of Section

SECTION 00 72 26
GENERAL CONDITIONS OF THE CONTRACT

PART 1 – GENERAL

1.01 DOCUMENTS

A. Refer to AIA A232-2009 General Conditions of the Contract for Construction. This document follows this sheet.

End of Section

AIA® Document A232™ – 2019

General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

for the following PROJECT:
(Name, and location or address)

Wolverine Power - Elmira Service Center
Elmira, MI

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

Apex Engineering & Management, Inc.
5101 Sawyer Woods Drive
Traverse City, MI 49685

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

Wolverine Power Supply Cooperative, Inc., 10125 W Watergate Road
Cadillac, MI 49601

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

Architecture Technology, PC1304 Business Park Drive
Traverse City, MI 49686

TABLE OF ARTICLES

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

Init.
/

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 the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their 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 other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 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.

§ 1.1.8 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.

§ 1.1.9 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.

§ 1.1.10 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 Construction Manager and the Architect do 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. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

§ 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 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 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.

§ 2.3.6 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.

§ 2.3.7 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.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 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 review by the Construction Manager and prior approval of the Architect, and the Construction Manager or 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 Construction Manager's and Architect's and their respective consultants' 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 Construction Manager or Architect in their 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 2.3.5, 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 Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and 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 Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and 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, the Construction Manager, and the 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. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager 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 the Project 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, in consultation with the Construction Manager, 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, Construction Manager, 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 Construction Manager or 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 or portions thereof 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 Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay 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, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, 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, in consultation with the Construction Manager, 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, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either 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, Construction Manager, 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, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require

additional time for review. Failure of the Construction Manager 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, Construction Manager, 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, and the Construction Manager's use in developing the Project schedule, 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. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 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 Construction Manager's and Architect's approval. The Architect and Construction Manager'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 Construction Manager and 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 participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 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 Construction Manager, Architect, and Owner, and delivered to the Construction Manager 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 and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are 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 Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, 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 reviewed and 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 Construction Manager and 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 Construction Manager and 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, the Architect, and the Construction Manager 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. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 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 Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

§ 3.13.1 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.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 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, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, 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, or Construction Manager with the Owner's approval, 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, Construction Manager, 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, Construction Manager, 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, Architect, or Construction Manager. 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 through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and 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 AND CONSTRUCTION MANAGER

§ 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 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and 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. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and 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, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the

Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager 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 Construction Manager 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 other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 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. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect 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 Construction Manager and 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 Construction Manager and 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.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 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 Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

§ 4.2.19 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 so rendered in good faith.

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

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request 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 other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 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 Construction Manager, for review by the Owner, Construction Manager 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 Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager 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, Construction Manager 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, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager 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, Construction Manager 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, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager 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 with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and 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 the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 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's own forces, Separate Contractors, Construction Manager and other 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's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and 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 or other Contractors' 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 Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, 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 delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.

§ 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, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors 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, other 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 Construction Manager, with notice to 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, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager 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

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, 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 Construction Manager and signed by the Owner, Construction Manager 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 Construction Manager 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 Construction Manager 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 Construction Manager and 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 Construction Manager 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 Construction Manager and 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 Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The 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 Construction Manager and 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 Construction Manager shall 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 Construction Manager 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 Construction Manager 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, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (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, based on the recommendation of the Construction Manager, 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 Construction Manager, 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 Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or 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 fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager 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, Construction Manager or

Architect require, such as copies of requisitions, and releases of waivers of lien 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 Construction Manager and 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 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager 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 Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager 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 Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in

Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager'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, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation 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, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 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 Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or 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 Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or 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 or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the 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 or other 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 or Construction Manager withholds certification for payment under Section 9.5.1, 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 Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project 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 Construction Manager and 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 Construction Manager 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 Owner, Construction Manager and Architect 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, Construction Manager 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 Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's 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 Construction Manager and Architect or awarded

by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner, Construction Manager 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 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 notify the Construction Manager, and the Contractor and Construction Manager shall jointly 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 list, the Architect, assisted by the Construction Manager, 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 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, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, 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 and Construction Manager shall jointly 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 after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, 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 completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their 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 Construction Manager's and Architect's final Certificate for Payment or Project 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 through the Construction Manager (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 Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and 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 through the Construction Manager 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. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 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;
- **.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; and
- **.4** construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 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, 10.2.1.3 and 10.2.1.4 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, 10.2.1.3 and 10.2.1.4. 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, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any 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, Construction Manager 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

§ 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, Construction Manager 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, Construction Manager 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, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager 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, Construction Manager, Architect, their 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, Construction Manager and Construction Manager's consultants, and the 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 directly to the Owner, and separately to the Construction Manager, 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

§ 11.2.1 The Owner 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 Owner 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.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform both the Contractor and the Construction Manager, separately and in writing, prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 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 Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) 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 Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, 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, Architect, and Construction Manager 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 Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, 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 Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their 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 Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or 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 Construction Manager or 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 Construction Manager's and 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, Construction Manager 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, Separate Contractors, or other 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, Construction Manager, 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 Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager, 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 Construction Manager and 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 Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager's and 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 Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or 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 Construction Manager has not certified or 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, 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, Construction Manager 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 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, Construction Manager and 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, after consultation with the Construction Manager, 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 Construction Manager's and 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, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, 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 the 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 this 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 Construction Manager and 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, the Construction Manager, 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 of 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 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

Additions and Deletions Report for

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Wolverine Power - Elmira Service Center
Elmira, MI

...

Apex Engineering & Management, Inc.
5101 Sawyer Woods Drive
Traverse City, MI 49685

...

Wolverine Power Supply Cooperative, Inc., 10125 W Watergate Road
Cadillac, MI 49601

...

Architecture Technology, PC1304 Business Park Drive
Traverse City, MI 49686

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Steven J Steimel, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 16:54:21 ET on 02/09/2021 under Order No. 4222925063 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A232™ - 2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

SECTION 00 73 16
INSURANCE REQUIREMENTS

PART 1 – GENERAL

1.01 INSURANCE CERTIFICATES

A. Each Contractor shall provide, prior to beginning of Work, a certificate of insurance for delivery to the Owner indicating that all required insurance coverage is in force. See Page 5 for Wolverine specific coverages, use the more stringent and higher values if conflicts occur.

B. Use standard Insurance Certificate Form. The Accord Form 25 (8/84) or 25-S (3/88) are preferable forms. These forms should be obtained from your Insurance agent.

Issue all certificates to: **Wolverine Power Cooperative**
10125 W. Watergate Road
Cadillac, MI 49601

C. Certificates must show as 'additional insured' the Owner, **Wolverine Power Cooperative**, the architect, **Architecture Technology, P.C.** and the Construction Manager, **Apex Engineering & Management, Inc**.

D. A "Letter of Compliance" must be completed and submitted along with the certificate of insurance. The "Letter of Compliance" form is Page 3 of this section.

E. Please refer to Exhibit A in this section.

NOTE: Sample Letter of Compliance follows

Letter of Compliance

Owner: _____

Contractor: _____

Project: _____

This letter is to acknowledge that I/We am/are the Insurance Agent(s) for the above named Contractor and furthermore, that we have reviewed the insurance coverage required under this Contract with the Owner:

Wolverine Power Cooperative

We hereby certify that said Contractor is in compliance with all insurance coverage required under this Contract with the Owner referenced above.

We hereby certify that said Contractor is in compliance with all insurance requirements, whether or not so evidenced in the attached certificate of insurance.

Signed: _____

Agency: _____

Address: _____

Agent: _____

Witness: _____

Date: _____

Notary: _____

My Commission Expires: _____

For: _____

Contractor: _____

Address: _____

Bid Division: _____

(1)

Exhibit A
Schedule of Insurance

1. **Insurance Policies**. Contractor shall procure and maintain in effect during the term of the Agreement, and for such longer periods as required by the Contract, the insurance coverages described below. All of the following insurance coverages shall be placed with insurance companies rated A/XII or better by the most current Best's Key Rating Guide and approved by Owner. Such insurance companies shall be authorized to do business in the jurisdiction in which the Project is located.

   1.1 **Worker's Compensation and Employers' Liability Insurance**.

      1.1.1 Worker's Compensation Insurance with statutory benefits and limits which shall fully comply with all State and Federal requirements applying to this insurance; which shall include Broad Form All States and Voluntary Compensation Endorsements, and which shall contain a waiver of subrogation in favor of Owner and each of its directors, officers, trustees, shareholders, employees and agents.

      1.1.2 Employer's Liability Insurance with limits of not less than Five Hundred Thousand Dollars ($500,000) per accident, Five Hundred Thousand Dollars ($500,000) per disease and Five Hundred Thousand Dollars ($500,000) policy limit on disease.

   1.2 **Business Automobile Liability Insurance**. Automobile Liability Insurance in Contractor's name including owned, non-owned, leased and hired motor vehicle coverage. Limits of Liability shall not be less than One Million Dollars ($1,000,000) combined single limit per occurrence for bodily injury and property damage.

   1.3 **Commercial General Liability Insurance**. Commercial General Liability Insurance in the Contractor's name which shall include at least the following coverages: (i) Bodily Injury, (ii) Property Damage, (iii) Personal Injury, (iv) Independent Contractor's Liability, (v) Products and Completed Operations (for a period of not less than three (3) years following final completion of the Work), (vi) Contractual Liability coverage broad enough to protect the portions of the hold-harmless/indemnification obligations of the Contractor under this Contract that are insurable under Commercial General Liability coverage, (vii) Explosion, Collapse and Underground Damage Liability (commonly referred to as the "XCU" hazards"), and (viii) Broad Form Property Damage coverage with a "per project endorsement". The Commercial General Liability Insurance provided on an "occurrence basis", *not* a "claims made" basis.

      1.3.1 Such liability policy must be further endorsed to:

         1.3.1.1 Name as additional insureds the Owner, all of the Indemnified Parties and any other person or entity designated by Owner, and with respect to all of the foregoing, each of their respective direct and indirect constituent entities, shareholders, officers, directors, agents and employees, by endorsement that is in form and substance satisfactory to Owner.

1.3.1.2 Stipulate that such insurance is primary and is not additional to, or contributing with, any other insurance carried by, or for the benefit of the additional insureds.

1.3.1.3 Waive any and all right of subrogation against Owner and all other additional insureds.

1.3.1.4 Contain cross liability and severability of interest endorsements.

1.3.2 The insurance required by Paragraph 1.3 shall be written for not less than the following limits, or greater if required by law:

1.3.2.1 A General Aggregate Limit: Two Million Dollars ($2,000,000) dedicated to this Project only.

1.3.2.2 Bodily Injury and Property Damage: One Million Dollars ($1,000,000) Each Occurrence.

1.3.2.3 Personal and Advertising Injury: One Million Dollars ($1,000,000) Per Person.

1.3.2.4 Medical Expense Limit shall be not less than Ten Thousand Dollars ($10,000) Per Person.

1.3.2.5 Products and Completed Operations: One Million Dollars ($1,000,000) Each Occurrence and in the Aggregate.

1.4 **Professional Liability Insurance [if needed]**. If a contractor provides design service as part of their work, Ie. fire suppression, truss design, pre-engineered metal building design, Professional Liability Insurance shall be provided in accordance with the following:

1.4.1 Professional Liability Errors and Omissions Insurance including contractual liability coverage with limits of not less than One Million Dollars ($1,000,000) per claim and in the aggregate;

1.4.2 Contractor shall maintain this coverage in effect during the term of this Agreement, and for a period of Three (3) years following final completion of the Work;

1.4.3 Any retroactive date or prior acts exclusion shall pre-date the date of this Contract and the date that any Work or services were provided in connection with this Project.

1.5 **Umbrella Liability Insurance**

1.5.1 Umbrella liability insurance with limits no less than Two Million Dollars ($2,000,000);

1.5.2 The umbrella liability policy shall provide coverage at least as broad as the coverage furnished under the underlying policies required in Paragraph 1.1-1.3 above.

2. **Subcontractors**.

2.1 All Subcontractors shall comply with all insurance requirements applicable to Contractor unless Owner consents otherwise in writing. Contractor agrees that it will identify qualified Subcontractors who can comply with the insurance provisions required of Contractor pursuant to the Contract.

2.2 Contractor agrees that it will promptly advise Owner in the event that any Subcontractor which it wishes to retain is unable to obtain such requisite insurance coverages; Contractor will obtain Owner's prior written approval of any deviations in such insurance coverages prior to entering into an agreement with such Subcontractor.

2.3 Contractor agrees that it will contractually obligate all Subcontractors to promptly advise Contractor of any changes or lapses of the requisite insurance coverages and Contractor agrees to promptly advise Owner of same.

2.4 Contractor assumes all responsibility for monitoring consultant insurance certificates for compliance with the insurance provisions of the Contract.

3. **Terms and Conditions**.

3.1 Before Contractor commences any services pursuant to the Contract, Contractor shall file with Owner valid and original certificates of insurance in form and substance satisfactory to Owner.

3.2 Contractor shall maintain current/valid certificates which shall be kept on file with Owner at all times during the performance of the Work. Such certificates shall identify the specific Project and location.

3.3 Contractor shall not make changes in or allow the required insurance coverages to lapse.

3.4 The coverage afforded under any insurance policy procured or maintained by Contractor or any Subcontractor in connection with the Project shall be primary to any valid and collectible insurance carried separately by any of the additional insureds. Further, all policies and any Certificates of Insurance shall expressly provide that no less than thirty (30) days prior written notice shall be given Owner in the event of material alteration, cancellation, non-renewal of expiration of the coverage contained in such policy or evidenced by such Certificate of Insurance.

3.5 All certificates of insurance and all notices required pursuant to this Exhibit __ shall be sent to the attention of:

Wolverine Power Supply Cooperative, Inc.
10125 W. Watergate Road
Cadillac, MI 49601
Attn: Klint Weaver

3.6 Receipt or review by Owner or Owner's representative(s) of any copies of insurance policies or insurance certificates, or failure to request such evidence of insurance or to object to any portion of such insurance that does not comply with the requirements of the Contract, shall not be deemed a waiver by Owner of any such requirements and shall not relieve Contractor of any obligation to comply with the insurance provisions of the Contract. The obligation to procure and maintain any insurance required by the Contract is a separate responsibility of Contractor and independent of the duty to furnish evidence of such insurance policies.

3.7 The insurance provisions set forth in the Contract shall not be construed as a limit on Contractor's responsibilities and liabilities pursuant to the terms and conditions of the Contract including, but not limited to liability for claims in excess of the insurance limits and coverages set forth herein.

3.8 If Contractor fails to maintain, or fails to confirm that a Subcontractor maintains, any insurance required by the Contract, Owner may, but is *not* obligated to, upon seven (7) days advance notice to Contractor, purchase the applicable insurance on behalf of Contractor or applicable Subcontractor. In addition to the terms of the Contract, Owner may *unilaterally* setoff and Owner's cost to purchase that insurance against money Owner owes to Contractor and withhold that money from payments to Contractor.

3.9 When any required insurance, due to the attainment of a normal expiration date or renewal date, shall expire, Contractor shall supply Owner with Certificates of Insurance that clearly evidence the continuation of all coverage in the same manner, limits or protection, and scope of coverage as is required by the Contract. All renewal and replacement policies shall be in form and substance satisfactory to Owner and written by carriers acceptable to Owner.

3.10 By furnishing evidence of insurance, Contractor represents and warrants to Owner that the limits and scope of coverage of such insurance comply in all respects with the requirements of the Contract and that the required limits, as of the date that such evidence of insurance is delivered to Owner, are unimpaired: (i) by any payments made, or reasonably expected to be made, by the insurer, or (ii) by any amounts reserved for pending claims or anticipated expenses.

End of Section

SECTION 00 73 19
SAFETY

PART 1 – GENERAL

1.01 DESCRIPTION

A. Safety is of the utmost importance on this project and is the responsibility of each individual Contractor. Each Contractor shall comply with all local safety ordinances and OSHA regulations and requirements while performing the Work.

B. Each Contractor is required to submit bound Material Safety Data Sheets (MSDS) to the Construction Manager, to be used for reference only, prior to transporting the material/chemical on site. In addition, it is the responsibility of each Contractor to maintain an accessible MSDS file for their employees, subcontractors, sub-subcontractors, and suppliers that are on site.

C. Each Contractor shall submit evidence of an Employer Safety Program that complies with current OSHA regulations and requirements prior to beginning any Contract Work.

D. Each Contractor and their Subcontractor(s), Sub-Subcontractor(s), and Suppliers shall take all necessary precautions to ensure the safety of the public and/or workers on the job, and to prevent accidents or injury to any persons, on, about, or adjacent to the premises where the Work is being performed. The Contractor and their Subcontractor(s), Sub-Subcontractor(s), and Suppliers shall comply with Federal or State OSHA regulations and all other laws, codes, ordinances, and regulations relative to safety and the prevention of accidents.

E. The Contractor shall designate a responsible representative at the jobsite as Safety Representative who shall be responsible for the promotion of safety and prevention of accidents, and shall enforce all applicable laws, ordinances, codes, rules, regulations, and standards pertaining to safety and prevention of accidents.

F. All working, on-site Contractors will be required to attend Weekly Safety Meetings held by Construction Manager.

G. Any and all accidents and injuries that occur on site are to be reported immediately to the Construction Manager. A written report of accident/injury, necessary medical treatment, and how accident will be prevented from occurring again is to be submitted to the Construction Manager within three (3) calendar days of the incident.

H. Each person working on site shall wear a high visibility jacket, vest or shirt at all times. Hardhats and safety glasses are also required when necessary.

I. COVID-19 – This project will follow CDC guidelines for construction work sites. At minimum:

- **a. If any of your workers have symptoms, they will not be allowed on the job site**
- **b. Notify the site supervisor if you have a worker that has a family member in their household with COVID-19.**
- **c. We will be limiting number or workers in small workspace areas such as trailers, vehicles or tight spaces within the building.**
- **d. We will mandate face coverings where social distancing isn't possible**
- **e. Limit tool sharing and please clean and disinfect common tools/vehicles shared by your workers**
- **f. Practice proper hand hygiene**

J. The Architect and the Architect's Consultants are not responsible for the jobsite safety.

End of Section

SECTION 01 31 13
PROJECT COORDINATION

PART 1 – GENERAL

1.01 CONSTRUCTION MANAGEMENT

A. This is a Construction Management project. There is no General Contractor. All Contractors on this project will contract directly with the Owner utilizing AIA document A132 or Apex Engineering & Mgt purchase order agreement. The CM and Owner will award contracts for all Bid Divisions involved in the Project. The Project will be controlled and administered by the Construction Manager (CM) & Owner, in conjunction with the Architect.

1.02 WORK ASSIGNMENTS

A. Nothing contained in the Contract Documents, and especially in the work scope of any Bid Division, shall be construed as a Work assignment to any construction trade industry. Each Contractor is responsible for their own decisions on Work assignments, and shall make them in accord with the prevailing practice in the areas of the Project, and in such a way that neither their progress nor the progress of others will be adversely affected.

B. Disputes that may arise over improper assignments or over assignments claimed by more than one Contractor shall be settled immediately by the Contractors and shall in no case result in a slow down or stoppage of Work of any Contractor.

1.03 RETAINAGE

A. The Owner will retain ten percent (10%) of the amount on material, labor and/or equipment purchased from suppliers for inclusion in the Work, until substantial completion of the project. The purpose of this provision is to ensure proper conformance to the Contract Documents.

1.04 PERFORMANCE OF WORK

A. All Contractors shall provide weekly input to the project as to how it is built. Consequently, it is the responsibility and obligation of each Contractor to utilize their manpower and resources according to the commitments made under the scheduling process and attend regular weekly and/or bi-weekly meetings where scheduling and sequencing will be discussed in detail.

1.05 PROMPTNESS OF EXECUTION

A. It is the intention of the Owner to complete the Project in the fastest practical time frame. Whereas varying conditions inherent in the construction process will affect the progress of the Work, it is the intent of each construction contract that the Contractor maintain the progress pace set forth in the schedule.

B. If contractor is expected to be on site working, and for whatever reason, cannot work on a given day, contractor shall make the CM aware that they will not be on site for that day.

1.06 PROGRESS PAYMENTS

A. Contractors who fail to maintain specified progress may be subject to retainage up to 100% of Progress Payments, at such times as those Contractors are judged by the Owner, and/or the Project Architect and Construction Manager, to be behind schedule.

1.07 PAYMENT FOR STORED MATERIALS

A. As a means of eliminating cost escalation on available items of material and equipment, and in the interest of obtaining competitive Bids, the Owner will provide payment for contract items purchased early and stored off, as well as on, the Project site. In order to qualify for such payment, the material

or equipment must be safely stored, protected, and insured against loss or damage, inspected and dedicated to this Project only. The contractor is required to provide proof of purchase and insurance, to the Owner, for the stored material whether it is located on or off site. Any extra cost of offsite storage is to be included as a part of the Bid Proposal.

B. Materials stored on the site shall be in the area designated by the Construction Manager. Material or equipment lost through theft, or mishandling, shall be replace by the Contractor, without cost to the Owner. The Contractor receiving materials shall provide and maintain protection of stored materials at no additional cost to the Owner. Storage containers/security fencing will NOT be provided by the Owner.

C. Requests for payment for stored materials must have acceptable itemized bills and proof of insurance included with all pay applications.

1.08 SCHEDULE OF VALUES

A. The Schedule of Values (Section 00 62 76 – 1.03) shall include the following mandatory items for any Contractor who provides on-site labor as a part of their Contract: Housekeeping/Final Clean Up.

B. Monthly allocations shall be made to each item as appropriate and as directed by the Construction Manager.

C. The value of the Housekeeping/Final Clean Up item shall be **two (2%)** of the Contract value, or as described by the Construction Manager.

1.09 MATERIAL AND EQUIPMENT EXPEDITING

A. Each Contractor shall require all manufacturers to notify their office twenty-four (24) hours in advance of arrival on jobsite. Contractor shall arrange for unloading of equipment/materials at the job site. Contractor must include means to unload all material or equipment as the **Construction Manager/Owner will NOT provide such equipment.**

B. Each contractor shall also arrange for storage of all on site materials. Coordinate with the CM.

C. The Construction Manager will initiate and coordinate an expediting program on the Owner's behalf in cooperation with each Contractor, incorporating all critical items of material and/or equipment provided under the various Bid Division contracts.

D. In order to ensure the timeliness and accuracy, each Contractor shall cooperate by providing order and acknowledgement documentation, without pricing, as required by the Construction Manager, on the Owner's behalf.

E. Each Contractor shall further cooperate by keeping the Construction Manager informed of all changes in the commitments previously incorporated in the expediting program, and, when deemed necessary by the Construction Manager, provide source contacts for direct expediting by the Construction Manager.

1.10 PROTECTION OF THE WORK OF OTHERS

A. Contractors shall consider protection of finished Work of prime importance. Care shall be taken by Contractors not to damage completed Work of other Contractors, and to provide adequate protection to their own completed Work.

B. When moving laborers and/or materials across floors, grades, roofs, other vulnerable surfaces, or through occupied areas, the Contractor shall provide adequate surface protection to prevent damage to surfaces.

1.11 MANDATORY ATTENDANCE AT MEETINGS

A. It is the responsibility of each Contractor to be suitably represented at Pre-Construction, and all Project Meetings, as determined by the Construction Manager.

1.12 PRE ON-SITE ACTIVITY MEETING

A. Each Contractor is required to meet on the site with the Construction Manager prior to beginning their Work. The purpose of this meeting is to review the intent of the Contract Documents as they pertain to the Contractor's Work, and to integrate the Contractor's schedule into the Project.

1.13 RETURN ACTIVITIES

A. Each Contractor is required to report to the Construction Manager prior to resuming Work on the Project after an absence from the site of one or more working days. The purpose of reporting is to make the Construction Manager aware of the Contractor's re-involvement with the Project, and to provide an update regarding any conditions that could affect the continuing Work of the Contractor.

1.14 CUTTING AND PATCHING

A. Each Contractor shall make arrangements with the Construction Manager for fitting their Work into the Project, and shall coordinate all fitting with other Contractors. Whenever any Contractor has been given sufficient information as to required openings prior to beginning their Work, they shall pay the cost for cutting and/or restoring if they fail to provide proper required openings.

B. Each Contractor shall be responsible for any cutting, fitting and patching that may be required to complete their Work if they have failed to properly notify the Construction Manager and preceding Contractors of any openings required. Contractors shall not endanger the Work of any other Contractor by cutting, excavating or otherwise altering any Work, and shall not cut or alter the Work of any other contractor except with the consent of the Construction Manager. Any costs caused by defective or ill-timed Work shall be borne by the party responsible for such Work.

C. Cutting or restoring work performed by any Contractor, for work that is rejected by the Architect shall be corrected under the direction of the Construction Manager, as instructed by the Architect. The Contractor responsible for the defective restoration shall incur the cost of such Work.

D. Cutting and patching of concrete floors and decks shall be performed in a neat and workman like manner, using a coring machine. After coring, each Contractor shall pack and grout openings around sleeves or other Work penetrating floors and decks.

E. No Contractor shall do any cutting that may impair the strength of any building or its components. No holes, except for small screws or bolts, may be drilled in beams or other structural members for the purpose of supporting or attaching Mechanical Work, without prior approval from the Architect or Engineer.

F. Each Contractor shall be responsible for the cutting and patching of holes and openings through walls, partitions, floors, ceilings, and roofs necessary for the installation of their Work. If the location for a hole or opening is through a joist, beam, or column, the Contractor shall notify the Construction Manager who, after consultation with the Architect and Engineer will instruct the Contractor how to proceed.

G. Each Contractor shall be responsible for the closing and patching of holes and openings through existing walls, partitions, floors, ceilings, and roofs created by demolition work they are shown to complete unless noted otherwise.

H. The Contractor responsible for patching shall provide both the rough (substrate) and finish surfaces. They shall employ only qualified tradesmen to assure that all work is done in a neat and workmanlike manner. All patching shall match adjacent surfaces.

1.15 BLOCKING, BACKING AND GROUNDS

A. Each Contractor shall be responsible for providing the blocking, backing and grounds necessary for the installation of their Work unless specifically noted on the drawings of work scopes, in which case said blocking, backing, and grounds shall be provided by the Bid Division supplying shown backing material.

1.16 ACCESS PANELS

A. Each Contractor shall be responsible for furnishing the necessary access panels for items of work installed under their contract unless noted otherwise in the work scopes.

B. Installation of all access panels shall be the responsibility of the Contractor erecting the wall or ceiling system.

C. If not specified, these access panels shall be approved by the Architect prior to installation.

End of Section

SECTION 01 32 19
SUBMITTALS

PART 1 – GENERAL

1.01 CONSTRUCTION SCHEDULES

A. Each Contractor shall review the Preliminary Project Schedule, including durations, as prepared by the Construction Manager. If you cannot make the start dates, finish dates or duration periods based on material lead times, available manpower, etc., state as such on the Bid Form. This information will be used to make decisions on the Final Construction Schedule.

1.02 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Contractors shall submit all shop drawings, product data, and samples required by the Construction Documents.

B. Submittals shall be transmitted to the Construction Manager's office in accordance with procedures and dates required by the Construction Documents.

C. In submitting shop drawings, product data and samples, each Contractor represents that they have checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. All submittals must be stamped and signed by the Contractor responsible for submitting, to attest to their review. Unstamped submittals will be rejected.

D. The Contractor shall not be relieved of responsibility for any deviation from the Contract Documents, or any errors and omissions in shop drawings, product data or samples by the Architect's approval thereof.

E. No portion of the Work requiring submission of shop drawings, product data or samples shall be commenced until the submission has been approved by the Architect-Owner.

F. Three (3) copies of all shop drawings and product data must be submitted. One (1) copy will be returned upon review. If more than one (1) copy is needed, Contractor will submit additional sets over and above the required. Electronic (pdf) shop drawings and product data are encouraged.

G. One (1) copy of all samples and color charts must be submitted.

H. A time allowance of fifteen (15) working days shall be allowed for the Owner-Architect-Engineer submittal review and processing.

1.03 PRE-CONTRACT AWARD SUBMITTALS

A. (Refer to Sections 00 21 13, 00 62 76 and 00 73 16.)

1.04 CONTRACT CLOSEOUT SUBMITTALS

A. (Refer to Sections 01 74 13, 01 77 19, 01 78 23, and 01 78 36.)

End of Section

SECTION 01 35 53
SECURITY PROCEDURES

PART 1 – GENERAL

1.01 SECURITY

A. Each Contractor shall bear full responsibility for protecting their own equipment, materials, and tools from damage, loss and vandalism.

B. In no way will the Construction Manager, Architect or Owner be held responsible for vandalism, loss or damage incurred on this project.

C. This project will not be secured or fenced in by the Construction Manager or Owner.

D. No watchman will be employed for this project.

End of Section

SECTION 01 51 00
TEMPORARY UTILITIES

PART 1 – GENERAL

1.01 DESCRIPTION

A. The Owner will allow each Contractor to use power and water, where available, for use in construction. All usage will be arranged for by the Construction Manager.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with the National Electric Code.

B. Comply with federal, state and local codes and regulation and with utility company requirements.

1.03 MATERIALS, GENERAL

A. Cords, connectors, etc. may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

1.04 TEMPORARY ELECTRICITY AND LIGHTING

A. The Electrical Contractor shall furnish, install and maintain a complete and adequate temporary electrical service and distribution system for use by the Construction Manager and all Contractors during the construction period. The Owner will provide service to the building, the electrical contractor will take it from there.

B. Two (2) days prior to the start of construction, the Electrical Contractor shall provide temporary power for the construction area.

C. The Electrical Contractor shall provide and maintain temporary lighting for all construction activities throughout the duration of the project.

D. Overtime work requiring standby electricians shall be at the expense of the Contractor requiring the same.

E. Installation of temporary electrical power and lighting shall be as scheduled by the Construction Manager.

F. All temporary electrical installations shall be in compliance with the latest National Electrical Code (N.E.C.) or OSHA, whichever is more stringent. Compliance with N.E.C. Section 210-8(b) shall be the responsibility of the Electrical Contractor. Assured grounding systems as defined in Exception Number 2 of N.E.C. Section 210-8(b) shall not be used in place of ground fault protection 9.

The Electrical Contractor shall completely remove the temporary electrical service, distribution system, and temporary lighting when directed to do so by the Construction Manager. The Contractors responsible for the installation of all ceilings and partitions shall patch their work as necessary after removal of the temporary electrical system at no additional cost to the Construction Manager or Owner.

G. The Owner shall pay for all electrical energy consumed during the construction period.

H. Any electrical requirements for power beyond 20 amp – single phase circuits shall be the responsibility of the Contractor requiring them.

1.05 TELEPHONE SERVICE

A. A telephone will NOT be installed at the project site. All contractors shall provide their own means of making offsite communication.

1.06 WATER

A. A temporary water distribution center will be provided in a nearby convenient location. The Contractor shall supply all hoses, tanks, etc. beyond that point.

1.07 SANITARY FACILITIES

A. The Construction Manager will arrange for temporary sanitary facilities.

1.08 TEMPORARY HEAT

A. Temporary heat and cold weather protection and heat within the cold weather protection shall be the responsibility of the installing Contractor if required.

1.09 EXECUTION

A. Each Contractor shall maintain and operate systems to assure continuous service, and avoid disruption of service.

1.10 REMOVALS

A. Each Contractor shall promptly remove their own temporary materials and equipment when their use is no longer required.

B. Each Contractor shall clean and repair damage they have caused by temporary installations or use of temporary facilities.

C. Each Contractor shall restore existing facilities they have used for temporary services to their specified or original condition.

D. Each Contractor shall remove rubbish and debris created by their Work into dumpster provided by the Owner on a daily basis.

E. Refer to Section 01 74 13 for additional information regarding cleaning.

End of Section

SECTION 01 74 13
PROGRESS CLEANING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Each Contractor shall execute cleaning during the progress of the Work, and at the completion of the Work, as required by the Supplementary Conditions and the Specification.

B. As indicated in section 01 31 13-1.08 – Project Coordination, 2% of the contract values shall be earmarked for Housekeeping/Final Cleanup and will only be paid to the contractor after all cleaning and disposal has been completed.

1.02 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operation to comply with codes, ordinances, regulation, and anti-pollution law.

PART 2 – PRODUCTS AND EQUIPMENT

2.01 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property, and which, will not damage surfaces.

B. Use only those cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned. Use low or no VOC cleaning materials.

C. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

D. Each Contractor shall provide his/her own cleaning equipment.

E. Each Contractor shall cooperate with the Owner and the Construction Manager regarding clean up.

PART 3 – EXECUTION

3.01 HOUSEKEEPING AND CLEAN-UP

A. Each Contractor shall execute daily housekeeping to keep their Work, the site, and adjacent properties free form accumulations of waste materials, rubbish, and windblown debris resulting from construction operations.

B. Each Contractor is financially responsible for his/her clean-up operations. Clean up must be timely as well as thorough in order to meet safety regulations and permit other Contractors to perform without hindrance form dirt and debris. The Construction Manager will coordinate Project housekeeping and take appropriate steps to maintain clean, safe working conditions. **Contractors failing to meet housekeeping requirements will be charged for services arranged by the Construction Manager to perform the cleanup.**

3.02 DUST CONTROL

A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

C. Clean up must be performed after each task is done.

D. Each Contractor is responsible for developing a plan for dust control and debris removal for each task prior to starting. CM will provide a site dumpster for all trades to dispose of debris. Each contractor will be responsible for getting their debris into the dumpster.

3.03 FINAL CLEANING

A. Each Contractor shall employ qualified persons for cleaning.

B. Installing Contractors shall remove grease, mastic adhesives, dust, dirt, stains, finger-paints, labels, and other foreign materials from exposed interior and exterior surfaces, for acceptance by the Construction Manager, prior to leaving the site.

C. Prior to final completion or Owner occupancy, each Contractor shall conduct an inspection of exposed interior and exterior surface and all work areas to verify that the entire Project is clean.

D. Reference individual Scopes of Bids for additional cleaning requirements.

End of Section

SECTION 01 77 19
CLOSEOUT REQUIREMENTS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Each Contractor shall comply with requirements stated in the General Conditions and in the Specifications for procedures in closing out the Work.

1.02 SUBSTANTIAL COMPLETION AND FINAL PROCEDURE

A. When a Contractor's work is 98% complete, and in compliance with the Contract, the Contractor will be provided with a Certificate of Substantial Completion, after proper certification by the Construction Manager and Architect. A list of Work in need of correction and a list of incomplete Work will be forwarded to the Contractor. Both the Construction Manager and the Architect will have input to each list.

B. Each Contractor will be allowed seven (7) days to complete the items on both of the lists beginning from the date stipulated on the Certification of Substantial Completion. The Contractor shall begin completion and correction activities within one (1) day(s) within receipt of the lists and complete all activities within the seven (7) day period specified. Contractors failing to perform in accord with these time parameters will be subject to the provisions of the Additional Conditions, and the Owner will have the right to carry out the corrective Work and/or complete the Work. The cost of correction or completion will be deducted from the Contractor's contract amount.

C. By the act of submitting the Certificate of Substantial Completion for execution by the Construction Manager and the Architect the Contractor represents that they have:
1. Reviewed the Contract Documents.
2. Inspected their Work for compliance with the Contract Documents.
3. Completed their Work in accord with the Contract Documents and all pertinent submittals.

D. They further represent that:
1. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
2. Their Work is completed and ready for final inspection.

1.03 CONTRACTOR'S CLOSEOUT DOCUMENTS

A. Upon Substantial Completion, the Contractor shall submit the following:
1. Evidence of compliance with requirements of governing authorities, including Certificates of Inspection.
2. Operating and Maintenance Data, Product Data and Instructions to the Owner's personnel.
3. Warranties and Bonds
4. Spare Parts and Maintenance Materials
5. Evidence of Payment and Release of Liens
6. Certificate of Substantial Completion
7. As Built Drawings incorporated into CM's onsite As Built Drawing record set.
8. Contractor Hazardous Materials Compliance Affidavit
9. Asbestos Free Affidavit

B. Three (3) complete sets of close out documents, properly bound, shall be provided to the Construction Manager upon Substantial Completion. In lieu of hard copies, a digital copy (CD or DVD) is acceptable and preferred.

1.04 FINAL APPLICATION FOR PAYMENT

A. Each Contractor shall submit the final Application for Payment in accord with the procedures and requirements stated.

B. Refer to Sections 01 78 23 and 01 78 36 for further information regarding submittals.

End of Section

SECTION 01 78 23
OPERATING AND MAINTENANCE DATA

PART 1 – GENERAL

1.01 DESCRIPTION

A. Each Contractor shall compile product data and related information appropriate to the Owner's maintenance and operation of products furnished under their contract.

B. Each Contractor shall instruct the Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.02 MAINTENANCE AND OPERATING MANUALS

A. Prior to Substantial Completion, each Contractor shall submit to the Construction Manager two (2) copies of all comprehensive maintenance and operating materials, presenting complete directions and recommendations for the proper care and maintenance of all visible surface, as well as maintenance and operating instructions for all equipment items which the Contractor has provided or installed. In lieu of hard copies, contractor can submit a digital version on CD or DVD.

B. Operating instructions shall include all necessary printed directions for correct operation, adjustment, servicing, and maintenance of movable parts. Also included shall be suitable part lists and diagrams showing parts and assembly.

1.03 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, each Contractor shall fully instruct the Owner's designated operating and maintenance personnel, at a time coordinated with the Owner, in the operation, adjustment, and maintenance of all products, equipment, and systems.

B. Manufacturer's operating and maintenance manuals shall constitute the basis of instruction. Each Contractor shall review the contents of such manuals with the Owner's personnel in full detail to explain all aspects of operation and maintenance.

End of Section

SECTION 01 78 36
WARRANTIES

PART 1 – GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide a written guarantee for all labor, material, equipment and workmanship for a minimum period of one (1) year for the date of Substantial Completion of the project (or longer period of time if stipulated in the specifications) covering the work of their entire Bid Division(s).

B. The Contractor shall also provide a written warranty covering all work of their entire Bid Division(s) for a minimum period of one (1) year from the date of final project completion (or longer period of time if stipulated in the specifications).

1.02 REQUIREMENTS

A. The Contractor shall provide a quantity of two (2) original written guarantees and warranties to the Construction Manager.

B. The Contractor shall review all guarantees and warranties to assure of their compliance with all conditions of the contract.

C. The Contractor shall assemble all guarantees and warranties, fully executed by each representative contractor, supplier, manufacturer and subcontractor, in three ring binders and submit to the Construction manager within ten (10) days of the date of Substantial Completion of the Project.

D. If the Owner elects to permit equipment and component parts of equipment into service during the progress of construction and issues such permission in writing, all such guarantees and warranties must be submitted to the Construction Manager within ten (10) days after inspection and acceptance.

E. For items of work where acceptance is delayed materially beyond the Date of Substantial Completion, the Contractor shall provide revised guarantees and warranties listing the acceptance date as the start of the guarantee and warranty period.

End of Section

SECTION 02 41 00 DEMOLITION

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Soil Materials: Section 31 20 00 “Earth Moving”

B) Dewatering: Section 31 20 00 “Earth Moving”

C) Excavation Support and Protection: Section 31 20 00 “Earth Moving”

1.2 REFERENCES

A) ANSI (American National Standards Institute)

(1) A10.6 “Safety Requirements for Construction and Demolition”

B) NFPA (National Fire Protection Association)

(1) 13 “Standard for the Installation of Sprinkler Systems”

(2) 241 “Safeguarding Construction, Alteration, and Demolition Operations”

1.3 DEFINITIONS

A) Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled, salvaged or recycled.

B) Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C) Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and reinstalled, removed and salvaged, or recycled.

1.4 PERFORMANCE REQUIREMENTS

A) Comply with all applicable local, state, and national environmental regulations and guidelines for the safe and ethical removal, storage, and/or disposal of all materials.

B) Comply with ANSI A10.6 and NFPA 241.

C) Provide barricades, fencing and other barriers as required to control access to the site and to protect people and adjacent property from harm and damage due to demolition and construction activities.

(1) Provide structural design of temporary barrier systems.

(2) Engage the services of a professional engineer to advise on structural requirements of temporary barrier systems, where required to prevent structural failure.

D) Provide adequate site lighting for the safety and protection of property and people.

E) Provide temporary utilities where existing services are disconnected.

F) Provide and maintain all temporary bracing, shoring and support of existing structures to preserve stability and prevent unexpected collapse.

(1) Provide structural design of temporary support systems.

(2) Engage the services of a professional engineer to advise on structural requirements of temporary support systems, where required to prevent structural failure.

G) Provide complete demolition and removal of all existing construction as required for a complete, proper, and finished installation of new construction, regardless of whether or not such demolition and removal are specifically indicated in the Drawings.

H) Coordinate demolition requirements for the work of all trades.

1.5 PROJECT CONDITIONS

A) Demolition notes and indications on drawings are not exhaustive.

(1) Thoroughly inspect the site prior to bidding and commencement of work to determine the exact nature and extent of demolition required for a complete and proper finished installation of new construction as its intent is expressed in the Construction Documents.

B) The Owner will occupy areas of the site adjacent to those in which selective demolition is required.

(1) Conduct demolition operations so the Owner's use of the facility will not be disrupted.

(2) Coordinate selective demolition with the Owner and occupiers of the site so as to minimize disruptions and potential hazards.

(3) Maintain access to existing walkways, exits, and other adjacent occupied or used areas.

(4) Provide new access prior to the removal of the existing access roads or sidewalks.

(5) Existing utilities to remain in service and protect them from damage during selective demolition operations.

(6) New utilities shall be installed, tested and approved prior to removal of existing utilities.

(7) Provide not less than 72 hours' notice to the Owner of activities that will affect the Owner's operations.

C) If materials suspected of containing hazardous substances are encountered, do not disturb.

(1) Immediately notify the Engineer and the Owner.

(2) Comply with the applicable regulations, laws, and ordinances concerning isolation of the danger encountered.

(3) Hazardous materials will be removed by the Owner under a separate contract, if encountered.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A) Investigate and survey existing conditions and correlate with requirements indicated to determine the extent of demolition/removal required.

B) Inventory the condition of items to be removed and salvaged.

C) Verify condition of existing utilities affected by demolition operations.

(1) Do not begin demolition work until applicable utility shut-off, disconnecting, relocations, and/or sealing have been completed and verified.

3.2 PROTECTION

A) Protect exterior areas, adjacent properties, and public rights-of-way from damage or disruption due to demolition activities.

B) Protect interior areas of existing facilities from weather and water damage during demolition and subsequent construction operations.

C) Protect construction indicated to remain against damage and soiling during demolition.

(1) When permitted by the Owner, items may be removed to a suitable, protected storage location during demolition and cleaned and reinstalled in the original locations after demolition operations are complete.

D) Brace and shore existing structural elements as required to maintain structural stability and safety of existing structures, site and landscape features, and earth.

E) Protect existing utilities from damage during demolition operations.

(1) Do not interrupt utilities serving occupied or operating facilities unless prior authorization has been obtained from the Owner and facility occupants.

(2) Provide at least 72 hours notice to the Owner if shutdown of service is required.

3.3 REMOVAL AND REINSTALLTION

A) Provide removal and reinstallation/relocation of existing items (including mechanical and electrical items) where required to achieve a complete and proper finished construction, including items which require removal or relocation due to conflicts or which are not in concert with new work, regardless of whether or not such removal or relocation is specifically indicated in the Drawings.

B) Where items are indicated to be removed and reinstalled, remove and store in a protected location until such time that they are to be reinstalled.

C) Clean and repair items to functional condition adequate for intended use.

(1) Where removed items are not suitable for reuse, notify the Owner and Engineer prior to or immediately after removal.

D) Reinstall items in locations indicated.

(1) Comply with installation requirements for new materials and equipment.

(2) Provide supports, anchorages, connections, and accessories necessary for proper function of reinstalled items.

3.4 SALVAGE

A) The Owner has identified on the plans any items to be salvaged for the Owner's future use:

B) The Owner will identify any additional items to be salvaged.

C) Clean salvaged items of dirt and demolition debris.

D) Deliver salvaged items to a secure storage area as directed by the Owner.

E) Protect salvaged items from damage during removal, transport and storage.

3.5 REPAIRS

A) Promptly repair damage not indicated to be removed caused by demolition operations.

(1) Coordinate repair of property on the building Site with the Owner.

(2) Coordinate repair of adjacent properties damaged during demolition and construction with the respective property owners.

(3) Coordinate repair of public properties and rights of way with public Authorities Having Jurisdiction (AHJ).

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A) Sort and recycle demolished materials to as great an extent as possible.

B) Transport and legally dispose of demolished materials off the Owner's property.

(1) Do not store or sell removed items or materials on the Project Site.

(2) Do not burn or bury demolished materials on the Project Site.

3.7 CLEANING

A) Maintain a clean and orderly work site during demolition.

B) Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations.

END OF SECTION

SECTION 03 11 00
CONCRETE FORMING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Concrete Reinforcement: Section 03 20 00 “Concrete Reinforcement”

B. Under-slab and Foundation Wall Rigid Insulation: Section 07 21 00 “Thermal Insulation”

C. Under-Slab Vapor Barriers: Section 07 26 00 “Air and Moisture Vapor Control”

1.02 REFERENCES

A. ACI (American Concrete Institute)
   1. 301 “Specifications for Structural Concrete for Buildings”
   2. 318 “Building Code Requirements for Structural Concrete”
   3. 347 “Guide to Formwork for Concrete”
   4. 504R “Guide to Joint Sealants in Concrete Structures”

B. ASTM (ASTM International)
   1. D1751 “Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)”

C. United States Army Corps of Engineers (CE)
   1. CRD-C 572 “Corps of Engineers Specifications for Polyvinylchloride Waterstops”

1.03 SYSTEM DESCRIPTION

A. Provide structurally sound concrete formwork, sufficient to produce concrete forms and finishes indicated.
   1. Take full responsibility for the design, installation, maintenance, and removal of all concrete formwork.

1.04 QUALITY ASSURANCE

A. Comply with ACI 318, unless modified by other requirements of the Contract Documents.

B. Comply with ACI 301, unless modified by other requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 FORMWORK MATERIALS

A. Furnish formwork and accessories in conformance with ACI 301 and ACI 347.
   1. Use form facing materials that will provide continuous surfaces true to plane and edges true to line, level, and plumb.
   2. Use form facing materials that will produce surface finish results of the quality specified.
   3. Do not use rust-stained steel form facing materials.
   4. Use form facing materials in largest practicable sizes to minimize joints.

5. Provide all attachment and anchorage materials, sealants, structural supports, and bracing as required to adequately support the concrete within the forms during placement and achieve the concrete configurations and finishes required.

B. Approved Concrete Form Facing Materials:
   1. Solid, sawn dimension lumber (for rough-formed finish concrete surfaces only).
   2. Plywood.
   3. Metal.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class.
   1. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Form Ties: Factory-fabricated, removable or snap-off metal or fiberglass reinforced plastic form ties designed to resist lateral pressures of fresh concrete on forms and to prevent spalling of concrete upon removal.
   1. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.
   2. Provide ties that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

E. Chamfer Strips: Wood, metal, PVC, or rubber strips.
   1. Minimum Dimensions: 3/4 inches by 3/4 inch.

2.02 FORM RELEASE AGENTS

A. Provide non-staining form release agents as appropriate for the form facing materials used and the concrete finishes required.
   1. Do not use barrier type agents in applications where the concrete finish will be exposed to view.
   2. Use form release agents formulated with rust-inhibitor for steel form facing materials.
   3. Use only water-based release agents.
   4. Maximum VOC: 250 grams per liter.
   5. Approved Product: Concrete Producers Solutions, Inc., “Natural Releaser.”
   6. Approved Product: Tamms Industries Inc., “Formshield VOC.”
   7. Approved Product: Tamms Industries Inc., “Formshield WB.”
   8. Approved Product: Imperial Western Products, Inc., “E-46 Bio Concrete Form Release.”

2.03 JOINT MATERIALS

A. Waterstops: Flexible PVC waterstops for embedding in concrete to prevent the passage of fluids through joints.
   1. Provide PVC waterstops complying with CE CRD-C 572.
   2. Profile: Flat or ribbed, with center bulb.
   3. Provide factory fabricated corners, intersections, and directional changes.
   4. Approved Product: Greenstreak, “Polyvinylchloride Waterstop.”
   5. Approved Product: W.R. Meadows Inc., “Premium PVC Waterstop.”

B. Preformed Keyway (for use in construction joints): Preformed plastic keyed construction joint form.
   1. Depth of Form: Equal to depth of slab-on-grade.

2. Approved Product: W.R. Meadows, “Sealtight Plastic Joint Materials.”

C. Isolation Joints: Continuous, preformed, asphalt-saturated cellulosic fiber joint filler strips complying with ASTM D1751.
   1. Joint Filler Dimensions: 1/2 inch thick by depth of slab, unless indicated otherwise.
   2. Approved Product: Homesote Company, “Homex 300.”
   3. Approved Product: W. R. Meadows, Inc., “Fibre Expansion Joint.”

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare concrete footing and slab-on-grade substrates as indicated and as required for proper formwork installation.

3.02 FORMWORK INSTALLATION

A. Design, construct, erect, shore, brace, and maintain formwork according to ACI 301 and ACI 347.
   1. Construct forms tight enough to prevent loss of wet concrete.
   2. Apply form release agents in accordance with the manufacturer’s instructions.

B. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve elevations and slopes required in finished concrete surfaces.
   1. Provide and secure units to support screed strips.
   2. Use strike-off templates or compacting-type screeds.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
   1. provide crush or wrecking plates where stripping may damage cast concrete surfaces.
   2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

D. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
   1. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts, accurately located, to elevations required.

E. Install foundation and under-slab insulation.
   1. Seal all joints with tape.
   2. Seal around all penetrations through insulation.

F. Install vapor barriers and waterproofing.
   1. Seal all sheet joints with tape.
   2. Seal all penetrations through vapor barriers and waterproofing.

G. Provide isolation joints at all non-structural intersections of concrete slabs-on-grade and other materials, including columns, walls, and penetrations.
   1. Follow ACI 504R.

3.03 FORMWORK REMOVAL

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that do not support the weight of the concrete may be removed after cumulatively curing at not less than 50 degrees Fahrenheit for a minimum of 24 hours after placement.

1. Where formwork is supporting the weight of the concrete, do not remove forms until concrete has achieved 75 percent of design strength and not less than 3 days minimum in warm weather and 7 days minimum in cold weather.
2. Break off exposed ends of form ties after forms are stripped and patch voids with a rich mortar to prevent corrosion stains.
3. Do not remove forms if concrete will be damaged by form removal operations.

B. Clean and repair surfaces of formwork that will be reused.

1. Do not re-use formwork that is damaged.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Concrete Formwork: Section 03 11 00 “Concrete Forming”

1.02 REFERENCES

A. ACI (American Concrete Institute)
1. 301 “Specifications for Structural Concrete for Buildings”
2. 318 “Building Code Requirements for Structural Concrete”
3. SP-66 “ACI Detailing Manual”

B. ASTM (ASTM International)
1. A36 “Standard Specification for Carbon Structural Steel”
2. A184 “Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement”
3. A307 “Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods, 60,000 PSI Tensile Strength”
4. A615 “Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement”
5. A1064 “Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete”
6. B695 “Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel”
7. C881 “Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete”

C. AWS (American Welding Society)
1. D1.4 “Structural Welding Code – Reinforcing Steel” (ANSI)

D. CRSI (Concrete Reinforcing Steel Institute)
1. MSP-1 “Manual of Standard Practice”
2. PRB-2 “Placing Reinforcing Bars”

1.03 SUBMITTALS

A. Submit Shop Drawings.
1. Placing drawings illustrating concrete reinforcing steel lengths, configuration, and layout for all reinforced concrete structural components.

B. Submit Product Data.
1. Permanent reinforcing steel supports.
2. Epoxy grout.

1.04 QUALITY ASSURANCE

A. Comply with ACI 301 and ACI 318, unless modified by other requirements of the Contract Documents.

B. Where reinforcement details are not specifically shown, comply with ACI SP-66.

PART 2 PRODUCTS

2.01 REINFORCEMENT MATERIALS

A. General Concrete Reinforcement: ACI 301, and CRSI MSP-1.
   1. Provide all hooked bars with standard hooks, unless detailed otherwise.

B. Reinforcing Steel Bars and Dowels: ASTM A615, deformed, unless specifically indicated to be smooth.
   1. Grade: 60.
   2. Minimum Yield Strength (Fy): 60,000 pounds per square inch.
   3. Design Bending Stress (Fb): 24,000 pounds per square inch.

C. Mechanical Splices and Connections for Steel Reinforcement:

D. Reinforcing Steel Bar Mats: ASTM A184.
   1. Fabricated from deformed reinforcing bars conforming with ASTM A615, Grade 60.

E. Plain Steel Wire (for stirrups and spirals): ASTM A1064.
   1. Minimum Yield Stress (Fy): 70,000 pounds per square inch.

F. Tie Wire: Black annealed steel wire.
   1. Minimum Gage: 16.5.

G. Welded Steel Wire Reinforcement (WWR): ASTM A1064 plain steel wire reinforcement grid in flat sheets.
   1. Minimum Yield Stress (Fy): 65,000 pounds per square inch.
   2. Mesh Configuration: 6 inches x 6 inches, W2.9 x W2.9 (unless indicated otherwise).
   3. Welded Wire Reinforcement (WWR) Support: Prefabricated, welded steel wire chairs, 3 inches high by 5 feet long with 2 continuous wire bottom runners.

H. Permanent Reinforcing Steel Supports: Bolsters, chairs, and blocks made from prefabricated steel wire, plastic, precast concrete or brick, following CRSI MSP-1.
   1. Where supports come in contact with exposed concrete surfaces, provide Class 1 corrosion-protected wire bar supports, or Class 2 stainless steel bar supports.
   2. Provide chair supports for welded wire reinforcement (WWR) in concrete slabs, sized to secure welded wire reinforcement in the top 1/3 of the slab.

2.02 ANCHORAGE MATERIALS

A. Anchor Bolts: Galvanized bolts fabricated from full-bodied ASTM A36 or ASTM A307, Grade A, steel rods having the same diameter as the bolt diameter, using cut threads.
   1. Do not use rolled threads.
   2. Mechanically deposited zinc coating: ASTM B695, Class 50.

3. Provide nuts and washers of matching material.

B. Epoxy Anchors: High strength two-part adhesive epoxy system designed to install reinforcing steel and threaded studs into solid concrete base materials, and complying with ASTM C881.
   1. Type: IV.
   2. Grade: 3.
   3. Class: A, B, C (except gel times).
   4. Approved Product: Hilti, Inc., “HSE 2411 Epoxy Adhesive Anchor.”
   5. Approved Product: Hilti, Inc., "HVA System."

C. Epoxy Grout: Moisture-tolerant, high-strength, fast-setting, chemically-resistant multi-component system consisting of epoxy resin, hardener, and graded aggregate.
   1. Minimum Bond Strength (at 28 days): 3,500 pounds per square inch, but not less than substrate (tested to substrate failure).
   2. Minimum Compressive Modulus (at 28 days): 1,500,000 pounds per square inch.
   3. Minimum Compressive Strength (at 28 days): 14,000 pounds per square inch.
   4. Minimum Flexural Strength (at 28 days): 4,100 pounds per square inch.
   5. Minimum Tensile Strength (at 28 days): 2,200 pounds per square inch.
   6. Use in strict accordance with the manufacturer’s written instructions.
   7. Approved Product: Symons (Div. of Dayton Superior), “Rescon 604 Epoxy Grout.”
   8. Approved Product: Euclid Chemical Co., “E3-HP High-Performance Epoxy Grout System.”
   9. Approved Product: Fox Industries, Foxpack-1700, “HS Precision Epoxy Grout.”
   10. Approved Product: Hilti, Inc., “HIT-HY150” or “HIT-ICE.”

PART 3 EXECUTION

3.01 REINFORCEMENT INSTALLATION

A. Place reinforcing bars in accordance with CRSI MSP-1 and CRSI PRB-2.

B. Support all reinforcing steel on permanent supports.
   1. Space supports in accordance with CRSI MSP-1.

C. Set bolts using rigid templates.

D. Fabricate bends and hooks in reinforcing bars in conformance with standard dimensions and tolerances detailed in ACI SP-66 and CRSI MSP-1, unless indicated otherwise.
   1. Bend all reinforcing bars, wire, and welded wire reinforcement (WWR) cold.
   2. Do not bend or straighten reinforcing bars in a manner that will injure the material.

E. Do not weld reinforcing bars unless specifically indicated or approved by the Structural Engineer.
   1. Use tie wire to mechanically connect reinforcing bar splices and bar crossings.

F. Where reinforcing bars are specifically indicated to be welded, follow AWS D1.4.

G. Maintain the following minimum concrete coverages for reinforcement and other embedded items:
   1. Concrete cast directly against earth: 3 inches.
   2. Concrete footings: 3 inches.
   3. Concrete walls exposed to earth or weather: 2 inches.
   4. Concrete not exposed to earth or weather: 1-1/2 inches.
   5. Concrete slabs: 1-1/2 inches.

H. Protect base plates and bolts with 3 inches minimum concrete cover.

I. Lubricate one half the length of smooth dowel bars at joint locations where indicated to provide movement along the axis of the bar.

J. Where concrete reinforcing is spliced, provide Class B per ACI 318, with applicable increases for bar spacing, cover, top bar effect, etc.
   1. Provide full-contact lap splices over a minimum distance of 30 bar diameters.
   2. Unless otherwise indicated, splice continuous bottom reinforcing bars at supports and continuous top reinforcing bars at mid-span.

K. Provide bent corner bars in all walls and footings of the same size and number as the continuous reinforcement.

L. Place welded wire reinforcement (WWR) in the top 1/3 of concrete slabs on grade, unless otherwise indicated.
   1. Lap splice adjacent sheets by one wire space plus 2 inches minimum.
   2. Support WWR on permanent supports.
   3. Wire WWR to permanent supports.
   4. Do not pull up WWR through fresh concrete.
   5. Repair all damage to insulations, vapor retarders, and waterproofing.

M. Set anchor bolts using rigid templates and supports until concrete has set.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Concrete Anchors: Section 03 20 00 "Concrete Reinforcement"

B. Under-slab and Foundation Wall Rigid Insulation: Section 07 21 00 “Thermal and Acoustic Insulation”

C. Under-Slab Vapor Barriers: Section 07 26 00 “Air and Moisture Vapor Control”

D. Sealant Joints in Concrete Assemblies (besides control joint filler): Section 07 92 00 “Joint Sealants”

1.02 REFERENCES

A. ACI (American Concrete Institute)

1. 301 “Specifications for Structural Concrete for Buildings”
2. 302.1R “Guide for Concrete Floor and Slab Construction”
3. 304R “Guide for Measuring, Mixing, Transporting, and Placing Concrete”
4. 305R “Hot Weather Concreting”
5. 306.1 “Standard Specification for Cold Weather Concreting”
6. 308.1 “Standard Specification for Curing Concrete”
7. 318 “Building Code Requirements for Structural Concrete”
8. CP-1 “Technicial Workbook for ACI Certification of Concrete Field Testing Technician-Grade 1”

B. ASCC (American Society of Concrete Construction

1. “Guide for Surface Finish of Formed Concrete”

C. ASTM (ASTM International)

1. C33 “Standard Specification for Concrete Aggregates”
2. C39 “Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens”
3. C42 “Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete”
4. C94 “Standard Specification for Ready-Mixed Concrete”
5. C143 “Standard Test Method for Slump of Hydraulic Cement Concrete”
6. C150 “Standard Specification for Portland Cement”
7. C172 “Standard Practice for Sampling Freshly Mixed Concrete”
8. C173 “Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method”
9. C231 “Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method”
10. C260 “Standard Specification for Air-Entraining Admixtures for Concrete”
11. C494 “Standard Specification for Chemical Admixtures for Concrete”

12. C618 “Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete”
13. C881 “Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete”
14. C989 “Standard Specification for Slag Cement for Use in Concrete and Mortars”
15. C1240 “Standard Specification for Use of Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar, and Grout”
16. C1315 “Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete”
17. C1602 “Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete”
18. D638 “Standard Test Method for Tensile Properties of Plastics”
19. D2240 “Standard Test Method for Rubber Property-Durometer Hardness”
20. E1155 “Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers”

1.03 SYSTEM DESCRIPTION

A. Concrete Piers.
   1. Minimum Concrete Compressive Strength: 4,000 pounds per square inch at 28 days.
   2. Maximum Slump: 5 inches (8 inches for concrete containing high-range water-reducing admixtures).
   3. Maximum Water-to-Cementitious Materials Ratio: 0.45.

B. Concrete Footings and Foundation Walls (soil on both sides).
   1. Minimum Concrete Compressive Strength: 3,500 pounds per square inch at 28 days.
   2. Maximum Slump: 4 inches (8 inches for concrete containing high-range water-reducing admixtures).
   3. Maximum Water-to-Cementitious Materials Ratio: 0.50.

C. Slabs-on-Grade.
   1. Minimum Concrete Compressive Strength: 4,000 pounds per square inch at 28 days.
   2. Maximum Slump: 5 inches (8 inches for concrete containing high-range water-reducing admixtures).
   3. Maximum Water-to-Cementitious Materials Ratio: 0.45.

D. Site Concrete (other than concrete pavements):
   1. Minimum Concrete Compressive Strength: 4,000 pounds per square inch at 28 days.
   2. Maximum Slump: 5 inches (8 inches for concrete containing high-range water-reducing admixtures).
   3. Maximum Water-to-Cementitious Materials Ratio: 0.45.

1.04 SUBMITTALS

A. Submit Shop Drawings.
   1. Concrete mix design(s) proposed for use and previous strength test data for proposed mix.

B. Submit Product Data.
   1. Physical data on concrete materials proposed for use.

2. Concrete admixtures.
3. Control joint filler.
4. Curing, sealing, and finishing materials.

C. Submit Test Results (tests performed by Owner-employed testing agency except where testing is pursuant to nonconforming/remedial conditions).
1. Concrete strength test results.
2. Concrete slump test results.
3. Concrete air content test results.
4. Concrete slab flatness and levelness test results, if required.

D. Submit Information.
1. Copies of all concrete delivery tickets, including the plant name, design water/cement ratio, batch weights per cubic yard, total batched weight of all materials for quantity delivered, date and time batched, design slump, allowable slump range, moisture correction for aggregates, dosages of all approved admixtures, record of any materials that were added to the batch during or after delivery to the site, date and time of placement, approximate location of use in structure, and signature of receiving party.
2. Record of subgrade temperature readings taken under areas to support concrete placed during cold weather.
3. Record of wet concrete temperature readings taken at the time of placement during cold weather.
4. Record of concrete temperature readings taken during cold weather concreting protection period.

E. Prior to cold weather concreting (as defined by ACI 306.1), submit details of proposed site preparation and concrete protection measures including, but not limited to, the following:
1. Procedures for protecting the subgrade from frost and the accumulation of ice or snow on reinforcement or forms prior to concrete placement.
2. Methods for temperature protection during concrete placement.
3. Types of covering, insulation, housing, or heating to be provided.
4. Curing methods to be used during and following the protection period.
5. Use of strength accelerating admixtures.
6. Methods for verification of in-place strength.
7. Procedures for measuring and recording concrete temperatures.
8. Procedures for preventing drying during dry, windy conditions.

1.05 QUALITY ASSURANCE

A. The Contractor is responsible for the scheduling, direction and coordination of concrete flatwork placement, finishing and curing to insure that concrete surfaces are properly prepared, cured, and dried in time for installation of finish flooring materials.
1. Do not use concrete mix designs or curing and sealing materials which may be deleterious to the performance or appearance of finish flooring.

B. Coordinate design and placement of housekeeping pads with mechanical and electrical trades.

C. Provide all concrete required for the Project, as indicated.
1. Provide all interior concrete, including footings, slabs, walls, columns, bases, housekeeping pads, and all other concrete indicated or required.

2. Provide all exterior concrete, including retaining walls, sign bases, fence post foundations, light pole bases, transformer pads, HVAC equipment pads, bollards, flag pole bases and all other concrete indicated or required.

D. Manufacturer Qualifications: Use firms experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.

E. Comply with ACI 318, unless modified by other requirements of the Contract Documents.

F. Comply with ACI 301, unless modified by other requirements of the Contract Documents.

G. Testing Laboratory Requirements: Use testing laboratories having a full-time registered engineer directly controlling laboratory activities.

1. Minimum Supervisory Lab Technician Requirements: ACI Grade II, Certified Level III or higher, NICET (National Institute for Certification in Engineering Technology) and having three years of experience in inspection and testing.
2. Minimum Field Technician Requirements: Field Testing Technician, Grade I, per ACI CP-1.

PART 2 PRODUCTS

2.01 BASIC CONCRETE MATERIALS

A. Cement: ASTM C150, Portland cement.

1. Type: I (typical).
2. Type: III (for high early strength, cold weather concreting only).
3. Use Type 1 white Portland cement where necessary to achieve concrete finish colors specified.

B. Water: ASTM C1602.

C. Normal-Weight Aggregates: ASTM C33.

1. Class: 3S (Severe weathering region).
2. Uniformly graded.
3. Maximum Nominal Size (Diameter): 3/4 inch for slabs-on-grade, 3/8 inch (pea gravel) for concrete toppings and stair treads, 1 inch elsewhere.
4. Provide aggregates from a single source.
5. Do not use aggregates containing organic material, clay lumps and friable particles, chert, iron spal, coal, shale, lignite, oolitic stone, or other soft, absorptive, or otherwise deleterious substances.
6. For exterior exposed concrete (concrete subject to moisture and freezing), use 100 percent crushed stone aggregate in order to eliminate materials containing substances that may cause spalling in finished concrete.

2.02 SUPPLEMENTARY CEMENTITIOUS MATERIALS (SCM)

A. Fly Ash: ASTM C618.

1. Class: C or F.

B. Silica Fume: ASTM C1240.

C. Slag Cement: Ground, granulated blast-furnace slag meeting ASTM C989.

1. Grade: 100 or 120.

2.03 CONCRETE ADMIXTURES

A. Air Entraining Admixture: ASTM C260.

B. Water-Reducing Admixture (conventional): ASTM C494.
   1. Type: A (for placement and workability).

C. High-Range Water-Reducing Admixture (superplasticizer): ASTM C494.
   1. Type: F or G (for placement and workability).

D. Water-Reducing, Accelerating Admixture: ASTM C494.
   1. Type: E (for placement and workability).
   2. Type C (high-early-strength, for cold weather concreting).
   3. Do not use admixtures that contain chloride.

E. Water-Reducing, Retarding Admixture: ASTM C494.
   1. Type: D (for placement and workability).

2.04 CURING AND FINISHING MATERIALS

A. Wet Curing Blankets: Single-use, wet curing blankets that provide constant and thorough hydration while maintaining a 100-percent relative humidity condition on the slab for a curing period of seven days resulting in less surface discoloration and a more evenly cured concrete slab.
   1. Provide moisture-retaining coverings that are natural colored, non-staining cellulose fabrics with an opaque and impervious coating applied to one side.
   2. Provide products with an impervious, non-perforated, reflective coating, providing UV protection.
   3. Minimum Absorption: 41 gallons of curing water wicked and held per 1,600 square feet roll of curing blanket.
   4. Approved Product: Sika, UltraCure NCF.

B. Penetrating Liquid Chemical Hardener and Sealer: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components.
   1. Densifiers shall contain nano-sized particles of reactive, amorphous colloidal silica in water, shall contain zero volatile organic compounds (VOC), and shall have a pH of 9.5 to 11.5.
   2. Products shall not form a gel or leave a visible residue or whitening when applied to concrete surfaces.
   3. Provide a colorless, odorless product that penetrates, hardens, and densifies concrete surfaces.
   4. Approved Product: ChemMasters, “Chemisil Plus.”
   5. Approved Product: Dayton Superior Corp., “Day-Chem Sure Hard.”
   6. Approved Product: Euclid Chemical Co., “Euco Diamond Hard.”
   7. Approved Product: L&M Construction Chemicals, Inc., “Seal Hard.”
   8. Approved Product: Prosoco, Inc., “Consolideck LS.”

2.05 JOINT FILLER MATERIALS

A. Control Joint Filler (for use in interior concrete slab applications): Flexible epoxy resin control joint filler, meeting ASTM C881, for saw-cut joints of concrete slabs on grade, designed to absorb the impact and shock of heavy loads and steel wheeled traffic, preventing erosion of control joint edges.
   1. Solids content: 100 percent.

2. Minimum Tensile Strength: 500 pounds per square inch, per ASTM D638.
3. Minimum Shore D Hardness: 50 per ASTM D2240.
4. Minimum Elongation: 6 percent.
5. Approved Product: Epoxy Systems, Inc. “Product #11.”
6. Approved Product: W. R. Meadows, Inc., “Sealtight Rezi-Weld Flex.”
7. Approved Product: Metzger/McGuire, “MM-80.”

B. Control Joint Filler (for use in exterior concrete slab applications and where joints are exposed to freeze-thaw cycling): Horizontal traffic joint filler as specified in Section 07 92 00, “Joint Sealants.”

2.06 CONCRETE MIXES

A. Comply with ACI 301 requirements for concrete mixtures.
1. Tailor concrete mix designs for specific applications indicated and ambient weather conditions anticipated during placement and curing periods.

B. Ready-Mixed Concrete: Comply with ASTM C94.
1. When air temperature is between 85 and 90 degrees Fahrenheit, reduce maximum mixing and delivery time from 1-1/2 hours to 75 minutes.
2. When air temperature is above 90 degrees Fahrenheit, reduce maximum mixing and delivery time from to 60 minutes.

C. Air Entrainment Range for Exterior Concrete: 4 to 8 percent (by volume).
1. Do not use air entrainment for interior concrete not exposed to freezing temperatures.

D. Fly Ash Limits: Not more than 30 percent of cement content by weight.
1. Make proper adjustments to mix design for “high volume fly ash” (HVFA) concrete, including reduction of water content and increase of superplasticizer content.

E. Silica Fume Limits: Not more than 10 percent of cement content by weight.

F. Slag Cement Limits: Not more than 40 percent of cement content by weight.

PART 3 EXECUTION

3.01 PREPARATION

A. Before placing concrete, verify locations of all pipe sleeves, embedded items, openings, equipments pads, electrical conduits, recesses, drains, etc.
1. Sleeve all openings for pipe, conduits, recesses, drains, etc. Provide minimum sleeve spacing of 3 sleeve diameters.

B. Before placing concrete, insure that atmospheric conditions will be within the allowable ranges established by ACI 306.1 and ACI 305R for the duration of the protection period.
1. Where ambient temperatures are below the minimum placement temperatures established in ACI 306.1, follow the protection requirements of ACI 306.1
2. Do not place concrete on frozen subgrade.
3. Do not place concrete around steel forms or massive metal embedments which are below 32 degrees Fahrenheit.

3.02 CONCRETE PLACEMENT

A. Comply with the recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete

B. Do not add water to concrete during delivery, at Project site, or during placement, unless water is withheld at the batch plant.
   1. Note any water withheld at the batch plant on delivery ticket.
   2. Do not exceed the amount of water indicated in the approved concrete mix design.

C. Where concrete is to be placed during cold weather, take temperature readings of the wet concrete at the time of placement.
   1. Submit a record of temperature readings to the Architect for information only.

D. Where concrete is to be placed on earth during cold weather, take temperature readings of the subgrade to support concrete immediately prior to placing concrete.
   1. Submit a record of temperature readings to the Architect for information only.
   2. If subgrade temperature is below 32 degrees Fahrenheit, take measures to warm the subgrade to above-freezing temperatures before placing concrete, in accordance with ACI 306.1.

E. Do not damage or displace reinforcing during concrete placement.

F. Do not damage or displace under-slab insulations, vapor barriers, and waterproofing during concrete placement.

G. Vibrate freshly placed formed concrete using either internal or external vibration equipment.
   1. If internal equipment is used, insert the vibrator at intervals of 1.5 times the radius of influence
   2. If external equipment is used, mount vibrators between 4 and 8 feet on center, depending upon the radius of influence, but only that distance required to maintain overlapping of adjacent vibrator influence.
   3. Run vibrators in place for 5 to 15 seconds, or enough time to allow the sphere of influence to travel outward to its maximum distance.
   4. Do not over-vibrate concrete.

3.03 FORMED CONCRETE FINISHING

A. Formed Concrete Finishes: As-cast, except for the repair of defects as required to comply with finish quality specified.

B. Finish for Formed Surfaces Not Exposed to View: Rough-form finish, in accordance with ACI 301 and ASCC “Guide for Surface Finish of Formed Concrete.”
   1. Fill tie holes for all ties made of corrodible material.
   2. Fill voids deeper than 1/2 inch.
   3. Make bonded repair when void area is larger than 24 square inches and deeper than 2 inches.
   4. Remove fins and offsets projecting greater than 1 inch.

C. Finishes for Formed Surfaces Exposed to View: Smooth-form finish, in accordance with ACI 301 and ASCC “Guide for Surface Finish of Formed Concrete.”
   1. Fill tie holes for all ties made of corrodible material.
   2. Fill all bugholes exceeding 3/4 inch in diameter
   3. Fill small areas of honeycomb or other voids with dry-pack mortar.

4. Make bonded repair when void area is larger than 16 square inches and deeper than 1/2 inch.
5. Remove fins and offsets projecting greater than 1/8 inch.

3.04 CONCRETE FLATWORK FINISHING

A. General: Comply with ACI 302.1R for screeding, re-straightening, and finishing operations for concrete surfaces.
   1. Do not wet concrete surfaces during finishing.

B. Screed surfaces with a straightedge and strike off.
   1. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleed water appears on the surface.
   2. Do not further disturb surfaces before starting finishing operations.

C. Float Finish.
   1. Provide float finish for surfaces to receive trowel finish.

D. Trowel Finish: Hard, smooth, uniform surface for exposed concrete and areas to receive resilient flooring, carpet, and other thin finish materials.
   1. Provide for all interior concrete slabs.

E. Provide trowel-finished interior concrete slabs achieving specified flatness values, as determined by ASTM E1155.
   1. Overall Value: Ff – 25.
   2. Minimum Local Value: Ff – 17.
   3. Use a highway straightedge where possible in cutting and filling operations to achieve surface flatness required.

F. Provide trowel-finished interior concrete slabs achieving specified levelness values, as determined by ASTM E1155.
   1. Overall Value: Fl – 20.
   2. Minimum Local Value: Fl – 15.
   3. Does not apply to floor surfaces sloping to drains.

G. Apply topical concrete sealers to all exposed interior concrete floor surfaces, as indicated in the Drawings.
   1. Apply in strict accordance with the sealer manufacturer’s written application instructions.
   2. Apply in multiple coats as recommended by the sealer manufacturer durable, long-lasting concrete protection and finish.

H. Broom Finish: After float and trowel finishing, roughen surface by fine brooming perpendicular to traffic direction.
   1. Provide for exposed exterior walks and landings.

I. Saw control joints in slabs-on-grade as soon as possible after placement, without damaging the concrete finishes, but not more than 12 hours after the slab hardens.
   1. Joint Dimensions: 1/4 inch wide by 1/4 slab thickness, except reduce depth as required where in-floor hydronic heating tubes are present.
   2. Locate control joints as shown in drawings, or if not shown, layout for a maximum joint spacing of 10 feet on center each way, or, in feet, 2 times the slab thickness in inches, whichever is greater.
   3. Lay out control joints to create rectangular panels as nearly square as possible, using a straight edge as a joint guide.

4. Avoid reentrant (inside) corners and sharp angles (less and 60 degrees).
5. Align control joints with changes in slab thickness, plan dimensions, and joints in adjoining slabs.
6. Terminate control joints at the slab edge, not at an intersecting joint or in the middle of the slab.

J. Where floor finishes require a smooth surface over control joints or where joints are exposed to freeze-thaw require a waterproof protection, fill joints flush with control joint filler.
1. Apply from 3 to 6 months after slab placement – the later the better.

K. Ease corners of above-grade, exposed concrete with 1/4 inch chamfer, unless indicated otherwise.

3.05 CONCRETE PROTECTION AND CURING

A. Concrete Curing: Follow ACI 308.1.
1. Protect concrete from premature drying and excessive hot or cold temperatures.
2. Continuous moisture-cure formed and unformed concrete for at least 7 days, or until concrete has reached 70 percent of its specified strength, whichever is longer.
3. Use manufactured, wet curing blankets, as specified above, installed in strict accordance with the manufacturer’s instructions, to achieve continuous, 100 percent relative humidity, wet curing of concrete slabs-on-grade for at least 7 days.
4. Begin curing immediately after finishing.

B. Hot Weather Concreting: Comply with ACI 305R and as follows.
1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees Fahrenheit at time of placement.
2. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.
3. Using liquid nitrogen to cool concrete is Contractor's option.
4. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
5. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete.
6. Keep subgrade moisture uniform without standing water, soft spots, or dry areas

C. Cold Weather Concreting: Comply with ACI 306.1 and as follows.
1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When air temperature has fallen to or is expected to fall below 40 degrees Fahrenheit, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 55 degrees Fahrenheit and not more than 80 degrees Fahrenheit at point of placement.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
6. Maintain minimum concrete temperature of 55 degrees Fahrenheit during concrete placement, finishing, and throughout the protection period.
7. Maintain concrete protection (protection period) until the concrete has achieved a minimum strength of 500 pounds per square inch.

8. Measure and record concrete surface temperature at intervals of 2 hours during the working day, and 8 hours during off-times for the duration of the protection period. Submit a record of concrete temperature measurements to the Architect for information only.
9. Do not allow the surface temperature of cast concrete to decrease at a rate faster than 50 degrees Fahrenheit during any 24 hour period after the end of the protection period.
10. All protection may be removed when the surface temperature of the concrete is within 20 degrees Fahrenheit of the ambient temperature.

D. Apply hardeners and water-repellant coatings to concrete in accordance with the manufacturer's instructions.
1. Apply hardener as a sealer after wet curing and air-dry.
2. Do not apply concrete hardeners and sealers prior to the time recommended by the manufacturer for adequate concrete curing and drying.
3. Do not apply concrete hardeners and sealers to surfaces which will receive subsequent finishes or coatings, except where use of the sealer is specifically approved by the manufacturer of the final concrete finish or coating.

3.06 HOUSEKEEPING PADS

A. Where housekeeping pads are indicated for MEP equipment, provide solid, cast-in-place concrete pads. Where housekeeping pads are not detailed, provide not less than the following:
1. Slab Size: At least as large as the footprint of the equipment supported.
2. Minimum Slab Thickness: 4 inches, unless indicated otherwise in Drawings.
3. Attachment to Concrete Slab Below: (1) minimum 6 inch long, #4 dowel at each corner of the housekeeping pad, placed 3 inches in from each corner, embedded a minimum 2 inches into the floor slab below, and bent into the middle of the housekeeping pad slab above.
4. Formwork: Clean, smooth, wood or metal forms without intermediate joints between slab corners.
5. Minimum Slab Reinforcement: Welded steel wire fabric (6 inches x 6 inches, W2.9/W2.9), supported on permanent supports at mid-slab.
6. Exposed Finishes: Smooth, steel trowel finish.
7. Exposed Corners: Chamfered or radiused, minimum 3/4 inch.

3.07 FIELD QUALITY CONTROL

A. The Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement.
1. Perform tests according to the applicable building code, ACI 301, and ACI 318.
2. Fresh Concrete Sampling Method: ASTM C172, except as modified for slump to comply with ASTM C94.

B. Strength Testing: Take samples for strength tests of each class of concrete placed each day not less than once a day, nor less than once for each 150 cubic yards of concrete, nor less than once for each 5,000 square feet of surface area for slabs or walls, nor less than a minimum of 5 randomly selected samples.
1. Strength Testing Method: ASTM C39.
2. Test at least one specimen at 7 days and at least two specimens at 28 days.
3. Retain at least one additional specimen in reserve for later testing if required.

C. Slump Testing: Perform slump tests on each class of concrete sampled for strength testing.
   1. Slump Testing Method: ASTM C143.

D. Air Content Testing: Measure air content in each class of concrete sampled for strength testing.
   1. Air Content Testing Method: ASTM C173, or ASTM C231, as applicable.

E. Floor Flatness and Levelness Testing: ASTM E1155.

F. Submit written test reports to the Architect within 48 hours of testing.

G. Report defective work to the Architect in writing.

H. Make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
   1. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders or sawed beams complying with ASTM C42 or by other methods as directed by the Architect.

I. Remove and replace Work that testing has shown to have failed to meet the specified requirements, at no cost to the Owner.

END OF SECTION

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 REFERENCES

A. AISI (American Iron and Steel Institute)
   1. D100 “Cold-Formed Steel Design Manual”
   2. SG-971-Spec “North American Specification for the Design of Cold-Formed Steel Structural Members”
   3. S100 “North American Specification for the Design of Cold-formed Steel Structural Members”
   4. S220 “North American Standard for Cold-formed Steel Framing – Nonstructural Members”
   5. S240 “North American Standard for Cold-formed Steel Structural Framing”
   6. S400 “North American Standard for Seismic Design of Cold-formed Steel.

B. ASTM (ASTM International)
   1. A123 “Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”
   2. A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”
   3. A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings”
   4. C754 “Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products”
   5. C955 “Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases”

C. AWS (American Welding Society)
   1. A5.1 “Covered Carbon Steel Arc Welding Electrodes”
   2. D1.3 “Structural Welding Code – Sheet Metal” (ANSI)

1.02 SYSTEM DESCRIPTION

A. Structural Properties of Cold-formed Steel Framing Members: AISI D100.

B. Structural Design of Cold-formed Steel Framing Members: AISI S100.

C. Seismic Design of Cold-formed Steel Framing: AISI S400.

D. Standard for Cold-formed Structural Steel Framing: AISI S240.

E. Standard for Cold-formed Non-structural Steel Framing: AISI S220.

F. Allowable Total Vertical Deflection of Ceiling Support Joist Framing: L/360.

G. Provide framing systems designed to accommodate movement of members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subjected to ambient temperature changes (range) of up to 120 degrees Fahrenheit.

1.03 QUALITY ASSURANCE

A. Plans and details for framing are a schematic representation of the framing at various locations and conditions on this Project.
   1. Do not scale or count framing members shown as a substitute for an accurate quantity take-off.
   2. Provide all framing necessary to completely frame the project and provide for all conditions encountered, whether specifically detailed or not.

B. AISI Specifications: Follow AISI SG-971-Spec and AISC D100.

C. Comply with the applicable requirements of AWS D1.3 for all welding of light gage steel members.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

A. Sheet Steel: ASTM A653, galvanized, structural steel.
   1. Grade for Uncoated Steel Thickness of 0.0428 Inch (20 gage) and Lighter Units: 33 (minimum yield strength, Fy, of 33,000 pounds per square inch).
   2. Grade for Uncoated Steel Thickness of 0.0538 Inch (19 gage) and Heavier Units: 50 (minimum yield strength, Fy, of 50,000 pounds per square inch).
   3. Minimum Zinc Coating: G60.
   4. Galvanizing Repair Paint: ASTM A780.

B. Metal Joists: Manufacturer’s standard load-bearing cold-formed, galvanized steel C-joists of size and gage indicated, complying with ASTM C955.
   1. Minimum Flange Width: 1-5/8 inches, or as indicated.
   2. Minimum Stiffening Flange Width: 1/2 inch.
   3. Provide joists with the manufacturer’s standard web punchouts for passage of mechanical and electrical elements.

C. Corrosion-Resistant Coatings: Follow ASTM A123.
   1. Galvanizing Repair Paint: ASTM A780.

2.02 MISCELLANEOUS AND ACCESSORY MATERIALS

A. Steel Framing Accessories: Fabricated from the same material and finish used for framing members, of manufacturer's standard thickness and configuration, unless otherwise indicated.
   1. Minimum Yield Strength (Fy): 33,000 pounds per square inch, unless indicated otherwise.

2.03 FASTENING MATERIALS

A. Mechanical Fasteners: Self-drilling screws, bolts, nuts, and washers.
   1. Hot-dip galvanized per ASTM A123.

B. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

C. Welding Electrodes: Follow AWS A5.1.
   1. Provide welds with throat thickness matching the thickness of the thinnest member connected.

PART 3 EXECUTION

3.01 PREPARATION

A. Thoroughly examine and design all connections (member-to-member and member-to-structure).

3.02 INSTALLATION, GENERAL

A. Metal Framing Installation: Comply with ASTM C754.
   1. Install components in accordance with the manufacturer’s instructions.
   2. Use materials that are straight and true, per the manufacturer’s tolerances.
   3. Do not flatten or straighten steel members in a manner that will damage the materials.
   4. Cut components neatly, to fit squarely together.
   5. Hold components firmly in position until properly connected at all joints.
   6. Erect components and assemblies free of twists and bents, with all members straight, square, and true-to-line.
   7. Repair damaged galvanized surfaces.

B. Where screw-attachment is used, use self-drilling screws of sufficient size and number to ensure the strength of the connection.
   1. Minimum Screw Penetration: 3 exposed full screw threads.
   2. Tighten screws in a manner to avoid stripping threads.
   3. Replace over tightened screws with properly seated screws.

C. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location.
   2. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

D. Welded Connections for Sheet Metal: Follow AWS D1.3.

E. Provide supplementary metal framing, furring, blocking, backing, and bracing for support of all fixtures, equipment, sidings, trims, grab bars, toilet accessories, furnishings, and similar construction.

1. Securely anchor supplementary framing, furring, blocking, backing, and bracing in place.
2. Do not use combustible materials.
3. Where wood is used, use only approved fire-retardant treated material.

3.03 JOIST INSTALLATION

A. Provide end blocking where joist ends are not otherwise restrained from rotation.

B. Place joists directly over bearing studs or provide a load-distribution member of suitable structural strength to transfer loads.

C. Provide web stiffeners where necessary at reaction points, and at points of concentrated loads.

D. Install joists with their web area perpendicular to the bearing surface.

E. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

F. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.04 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanizing repair paint in accordance with ASTM A780.

B. Repair or replace damaged cold-formed steel framing members.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 REFERENCES

A. ASTM (ASTM International)
1. A36 “Standard Specification for Carbon Structural Steel”
2. A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”
3. A123 " Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”
4. A153 “Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”
5. A307 “Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods, 60,000 PSI Tensile Strength”
6. A325 “Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength”
7. A490 “Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength”
8. A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings”
9. B633 “Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel”
10. C881 “Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete”
11. C1107 “Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)”
12. E985 “Standard Specification for Permanent Metal Railing Systems and Rails for Buildings”
13. F436 “Standard Specification for Hardened Steel Washers”

B. AWS (American Welding Society)
1. D1.1 “Structural Welding Code - Steel” (ANSI)

C. FS (Federal Specification)
1. FF-S-325 “Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry)”
2. FF-W-92 “Washer, Flat (Plain)”

D. NAAMM (National Association of Architectural Metal Manufacturers)
1. MBG 531 “Metal Bar Grating Manual for Steel, Stainless Steel, and Aluminum Gratings and Stair Treads"

E. SSPC (Steel Structures Painting Council)
1. PA-1 “Shop, Field, and Maintenance Painting of Steel”
2. Paint 20 “Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)”
3. Paint 25 “Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II”

4. SP-3 “Power Tool Cleaning”

1.02 SYSTEM DESCRIPTION

A. Provide pipe bollards with premanufactured, prefinished covers, as specified.

B. Provide steel floor gratings capable of withstanding a uniform load of 300 pounds per square foot and a concentrated load of 3,000 pounds, so located to produce maximum stress conditions.

1.03 SUBMITTALS

A. Submit Product Data.
1. Prefinished pipe bollard covers.

PART 2 PRODUCTS

2.01 METAL SHAPES

A. Plates, Bars, Angles, Channels, and Miscellaneous Fabrications: ASTM A36.

B. Galvanized Steel Framing Members: ASTM A123.
1. Minimum Zinc Coating: G60.

C. Steel Floor Grating: Floor grating fabricated from ASTM A36 structural steel bars in conformance with NAAMM MBG 531.
1. Provide steel angle supports, anchors, connectors and all similar accessories for a complete, structurally stable installation.
2. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 ounces per square foot of coated surface.
3. Furnish Setting Drawings, templates, and directions for installing frames and anchorages, including concrete inserts.

2.02 PIPE BOLLARDS

A. Steel Pipe Bollards: Standard, schedule 40, black steel pipe per ASTM A53, concrete filled and set in concrete footing to minimum 2.5 feet below grade.
1. Pipe Outside Diameter: 6 inches, unless indicated otherwise.
2. Crown concrete at top op pipe to shed off bollard, unless bollard covers are used.
3. Provide primer and two-coat paint finish.
4. Sleeves for Steel Pipe: steel pipe sized for snug fit of post outside diameter into sleeve inside diameter.

B. Bollard Covers: Prefinished plastic pile sleeves for steel pipe bollards.
1. Material: Durable, high molecular weight, abrasion-resistant plastic designed for optimum balance of density, molecular weight, and molecular weight distribution demonstrating maximum property advantages for large products that require high impact resistance.
2. Provide products with ultraviolet protection additive warranted for at least five years.
3. Nominal Wall Thickness: 0.125 inches.
4. Provide bollard covers with two strips of 3M Series Reflective tape recessed into the bollard cover near the top and about 6 inches apart.
5. Minimum Flexural Modulus: 200,000 pounds per square inch.
6. Minimum Tensile Strength: 4,000 pounds per square inch.

7. Size: As indicated in the Drawings.
8. Color: As indicated in the Drawings.
9. Approved Product: Encore Commercial Products, Inc., Post Guard Bollard Covers.

2.03 BOLTS, CONNECTORS, AND ANCHORS

A. Regular-Strength Bolts and Nuts: Hexagon head type, unfinished, ASTM A307.
   1. Grade: A.
   2. Plain Washers: Round, flat carbon steel, FS FF-W-92.

B. High-Strength Bolts and Nuts: Hexagon head type, ASTM A325N or ASTM A490, fully pretensioned.
   1. High-Strength Washers: Round, flat carbon steel, ASTM F436.

C. Undercut Anchors: Self-undercutting mechanical anchors for heavy-duty fastenings into concrete.
   1. Material: Carbon steel.
   2. Zinc Plating: ASTM B633.
   3. Minimum Embedment: 3-1/2 inch, unless indicated otherwise.
   4. Provide stainless steel anchors where connection will be subject to moisture.
   5. Approved Product: Hilti, Inc., “HDA-T.”

D. Sleeve Anchors: Mechanical expansion bolts consisting of an externally threaded stud with a full length expanding sleeve for use in hollow and solid concrete and masonry base materials.
   1. Conforming to Federal Specification FF-S-325, Group II, Type 3, Class 3, for expansion shield anchors.
   2. Material: Carbon steel.
   3. Zinc Plating: ASTM B633, Sc. 1, Type III.
   4. Sleeve Anchor Diameter: 3/4 inch (5/8 inch bolt), unless indicated otherwise.
   5. Head Type: Hex head[Philips flat head, Round slotted head].
   6. Minimum Embedment: 2 inch, unless indicated otherwise.
   7. Provide stainless steel anchors where connection will be subject to moisture.
   8. Approved Product: Hilti Inc., “Sleeve Anchor.”
   9. Approved Product: Simpson Strong-Tie, “Sleeve-All Anchor.”

E. Wedge Bolts: Stud type mechanical expansion anchors with a single piece, three section wedge for use in solid concrete and fully grouted concrete masonry base materials.
   1. Conforming to Federal Specification FF-S-325, Group II, Type 4, Class I, for concrete expansion anchors.
   2. Material: Carbon steel.
   3. Zinc Plating: ASTM B633.
   4. Bolt Diameter: 3/4 inch, unless indicated otherwise.
   5. Nut Type: Hex nut matching bolt material.
   6. Minimum Embedment: 3-1/2 inch, unless indicated otherwise.
   7. Provide stainless steel anchors where connection will be subject to moisture.
   8. Approved Product: Hilti, Inc., “Kwik Bolt III.”
   9. Approved Product: Simpson Strong-Tie, “Wedge-All Anchor.”

F. Epoxy Anchors: High strength two-part adhesive epoxy system designed to install reinforcing steel and threaded studs into solid concrete base materials, and complying with ASTM C881.
   1. Type: IV.
   2. Grade: 3.
   3. Class: A, B, C (except gel times).
   4. Approved Product: Hilti, Inc., “HSE 2411 Epoxy Adhesive Anchor.”
   5. Approved Product: Hilti, Inc., "HVA System."
   6. Approved Product: Simpson Strong-Tie, SET-XP Structural Anchoring Adhesive and IXP anchors.

G. Pin-Driven Expansion Anchors: Pin-drive expansion anchors with integrated nut and washer.
   1. Material: Carbon steel with zinc dichromate coating.
   2. Approved Product: Simpson Strong-Tie, “Easy-Set Pin-Drive Expansion Anchor.”

H. Drop-In Anchors: Internally-threaded, controlled expansion anchors with preassembled expander plug.
   1. Material: Carbon steel.
   2. Zinc Plating: ASTM B633.
   3. Approved Product: Simpson Strong-Tie, “Drop-In Anchor.”

I. High-Strength Concrete and Masonry Screw Anchors: Threaded, self-undercutting, non-expansion, removable screw anchors for concrete and masonry applications.
   1. Material: Heat-treated carbon steel.
   2. Zinc Plating: ASTM B633.
   3. Approved Product: Simpson Strong-Tie, “Titen HD Anchor.”
   4. Approved Product: Hilti, Inc., "Kwik-Con II Masonry Screw Anchor."

J. Concrete and Masonry Screws: Multi-purpose, Phillips or hex-head concrete and masonry screws.
   1. Material: Heat-treated carbon steel, zinc-plated, with a baked-on ceramic coating.
   2. Diameter: 3/16 inch and 1/4 inch, as applicable.
   3. Approved Product: Simpson Strong-Tie, “Titen Concrete & Masonry Screw.”

K. Electrodes (for field and shop welding): In compliance with AWS requirements.

2.04 PRIMER

A. Primer: Lead-free, water-based, rust inhibitive primer suitable for use over hand-cleaned steel.
   1. SSPC-Paint 25.
   2. Type: I or II.
   3. Do not use solvent-based products.
   4. Approved Product: The Sherwin-Williams Company, “Pro-Cryl Universal Acrylic Primer.”
   5. Approved Product: Joan T. Geiger Enterprises, Inc., “Corroseal Rust Converting Primer.”

B. Primer for Steel Subject to Dampness or High Humidity: SSPC Paint 25.

C. Galvanizing Repair Paint: SSPC Paint 20.

2.05 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
   1. Grade for Drypack Grout: A.
   2. Grades for Flowable Grout: B and C.
   3. Approved Product: Sonneborn (div. of Chemrex), Sonogrout 10K.

B. Epoxy Grout: Moisture-tolerant, high-strength, fast-setting, chemically-resistant multi-component system consisting of epoxy resin, hardener, and graded aggregate.
   1. Minimum Bond Strength (at 28 days): 3,500 pounds per square inch, but not less than substrate (tested to substrate failure).
   2. Minimum Compressive Modulus (at 28 days): 1,500,000 pounds per square inch.
   3. Minimum Compressive Strength (at 28 days): 14,000 pounds per square inch.
   4. Minimum Flexural Strength (at 28 days): 4,100 pounds per square inch.
   5. Minimum Tensile Strength (at 28 days): 2,200 pounds per square inch.
   6. Use in strict accordance with the manufacturer’s written instructions.
   7. Approved Product: Symons (Div. of Dayton Superior), Rescon 604 Epoxy Grout.
   8. Approved Product: Euclid Chemical Co., E3-HP High-Performance Epozy Grout System.
   9. Approved Product: Fox Industries, Foxpack-1700, HS Precision Epoxy Grout.
   10. Approved Product: Hilti, Inc., “HIT-HY150.”

2.06 GENERAL FABRICATION

A. Verify all dimensions before fabrication.

B. Fabricate and assemble assemblies in the shop to the greatest possible extent.
   1. Properly mark and match-mark materials for field assembly.
   2. Fabricate for delivery sequence to expedite erection and minimize field handling of materials.

C. Cut, fit and assemble work with surfaces smooth, square and with complete contact at joints.
   1. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes.

D. Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods producing true alignment of axes without warp.

E. Weld all work continuously.
   1. Grind smooth and flush all exposed joints to make seams not visible after priming.

F. Provide hot-dip galvanized members where indicated in drawings.
   1. Minimum Zinc Coating: G60.

G. Repair galvanized surfaces following ASTM A780.

2.07 FINISHES

A. Galvanized Finishes: ASTM A153.

B. Preparation for Shop Priming: Prepare steel surfaces in compliance with SSPC SP-3.

C. Immediately after surface preparation, apply steel primer paint in accordance with the manufacturer's instructions and SSPC PA-1.
   1. Minimum Dry Film Thickness: 2.0 mils.
   2. Use painting methods resulting in full coverage of joints, corners, edges and exposed surfaces.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Provide anchorage devices and fasteners for securing metal fabrications to in-place construction.
   1. Perform cutting, drilling, and fitting required for installing metal fabrications.
   2. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.
   3. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
   4. Fit exposed connections accurately together.
   5. Weld connections, unless otherwise indicated.
   6. Do not weld, cut, or abrade galvanized surfaces.

B. Provide mechanical fasteners, protective finishes, and all miscellaneous accessories for complete installation.

C. Touch-up field welds and abraded areas with shop primer immediately after installation.
   1. Repair galvanized surfaces in accordance with ASTM A780.

3.02 PIPE BOLLARD INSTALLATION

A. Anchor in place with concrete footings.
   1. Support and brace bollards in position in footing excavations until concrete has been placed and cured.

B. Fill bollards solidly with concrete.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Sill Seal Gaskets: Section 07 21 00 “Thermal and Acoustic Insulation”

B. Rigid Insulation Boards: Section 07 21 00 “Thermal and Acoustic Insulation”

C. Vapor Barriers: Section 07 26 00 “Air and Moisture Vapor Control”

1.02 REFERENCES

A. AAMA (American Architectural Manufacturers Association)

1. 2604 “Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels”

B. AF&PA (American Forest and Paper Association, American Wood Council)

1. “Wood Frame Construction Manual for One and Two-Family Dwellings”

C. ANSI (American National Standards Institute)

1. B18.2.1 “American National Standard for Square and Hex Bolts and Screws”

D. ASTM (ASTM International)

1. A153 “Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”
2. A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”
3. B209 “Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate”
4. B633 “Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel”
5. C881 “Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete”
6. C920 “Standard Specification for Elastomeric Joint Sealants”
7. D412 “Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension”
8. D461 “Standard Test Methods for Felt”
9. D903 “Standard Test Method for Peel or Stripping Strength of Adhesive Bonds”
10. D1970 “Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection”
11. D2898 “Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing”
12. D3498 “Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems”
13. D3767 “Standard Practice for Rubber-Measurement of Dimensions”
14. D5664 “Standard Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber”

15. D6305 “Standard Practice for Calculating Bending Strength Design Adjustment Factors for Fire-Retardant-Treated Plywood Roof Sheathing”
16. E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”
17. E96 “Standard Test Methods for Water Vapor Transmission of Materials”
18. E2112 “Standard Practice for the Installation of Exterior Windows, Doors and Skylights”
19. F1667 “Standard for Driven Fasteners: Nails, Spikes, and Staples”

E. AWPA (American Wood Protection Association)

1. P17 “Fire-Retardant Formulations”
2. P49 "Standard for Fire Retardant FR-1 (FR-1)"
3. T1 “Use Category System: Processing and Treatment Standard”

F. CABO (Council of American Building Officials)

1. NER-272 “Pneumatic or Mechanically Driven Staples, Nails, P-Nails and Allied Fasteners for Use in All Types of Building Construction”

G. FS (Federal Specification)

1. FF-S-111 “Screw, Wood”
2. FF-S-325 “Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry)”

H. NFPA (National Fire Protection Association)

1. 703 "Standard for Fire-Retardant Impregnated Wood and Fire-Retardant Coatings for Building Materials"

1.03 SUBMITTALS

A. Submit Product Data.

1. Fire retardant treated wood, including third-party evaluation reports indicating that products proposed meet the minimum standards and qualities specified.
2. Industrial pultruded structural grating.

1.04 QUALITY ASSURANCE

A. Plans and details show a schematic representation of the blocking required at various locations and conditions on this Project.

1. Do not scale or count framing members shown as a substitute for an accurate quantity take-off.
2. Provide all supplemental framing and blocking necessary and provide for all conditions encountered, whether specifically detailed or not.

B. Reject wood materials which are warped, bowed, twisted, excessively soiled, or which fail to meet the grade and physical strength requirements specified.

1. Do not use wood materials which have been exposed to moisture after the time of dressing and shipment without first allowing them to dry thoroughly.
2. Do not use materials which are moldy or which show signs of mold growth.

C. Do not use products containing urea formaldehyde.

D. Where specified, and wherever possible, use low-VOC products.

E. Where penetrations or joints are made in or between fire-resistance-rated assemblies, provide tested and approved fire safing sealing assemblies and fire-resistance rated joint systems in accordance with Section 07 80 00.

PART 2 PRODUCTS

2.01 FIRE-RETARDANT TREATED WOOD (FRT)

A. Provide fire-retardant treated wood materials impregnated with chemicals by a pressure process or other means during manufacture.
   1. Provide materials meeting the requirements of NFPA 703.

B. Provide materials meeting the requirements for Class A, tested in accordance with ASTM E84, exhibiting the flame spread requirements specified below, and showing no evidence of significant progressive combustion when the test is continued for an additional 20 minutes. In addition, the flame front shall not progress more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Maximum Flame Spread Index: 25.
   2. Maximum Smoke Developed Index: 50.

C. Where fire retardant treated wood is used in exterior or wet area applications, provide materials meeting the requirements of ASTM D2898 (rain test).

D. Acceptable Fire-Retardants: Materials listed in AWPA P17.
   1. Use treatment materials that do not promote corrosion of metal fasteners.
   2. Do not use materials containing halogens, chlorides, arsenic, sulfates, chromium, formaldehyde, or ammonium phosphate.
   3. Provide fire retardant materials meeting the requirements of AWPA P49 (FR-1).

E. Fire-Retardant Treatments: Follow AWPA T1.
   1. Exterior Use Materials: UCFB.
   2. Interior Use Materials: UCFA.

F. Adjust structural design values for fire-retardant treated wood based upon a building-code-approved method of investigation that takes into consideration the effects of the anticipated temperature and humidity to which the fire-retardant treated wood will be subjected, the type of treatment, and re-drying procedures involved in the treatment of the wood.
   1. Structural Evaluation of Fire-Retardant-Treated Lumber: ASTM D5664.
   2. Structural Evaluation of Fire-Retardant-Treated Plywood: ASTM D6305.

G. Provide fire-retardant treated wood materials bearing permanent labeling including the following information:
   1. The identifying mark of an approved testing agency (UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to Authorities Having Jurisdiction).
   2. Identification of treating manufacturer.
   3. Name of fire-retardant treatment.
   4. Wood species treated.
   5. Flame spread and smoke developed index.
   6. Drying method used after the treatment.

7. Conformance with appropriate standards.
8. For fire retardant treated wood exposed to weather, include the words “No increase in the listed classification when subjected to the Standard Rain Test” (ASTM D2898).

H. Use hot dip zinc-coated galvanized steel, stainless steel, silicon bronze, or copper fasteners for fire-retardant treated wood.

1. Coating weight for zinc-coated fasteners: In accordance with ASTM A153.

2.02 CONNECTORS

A. Framing Nails and Staples: ASTM F1667.

1. Minimum Average Bending Yield Strength for Nails Having Shank Diameters Less Than 0.142 inch: 100,000 pounds per square inch.
2. Minimum Average Bending Yield Strength for Nails Having Shank Diameters Between 0.142 inch and 0.177 inch: 90,000 pounds per square inch.
3. Minimum Average Bending Yield Strength for Nails Having Shank Diameters Between 0.177 inch and 0.254 inch: 80,000 pounds per square inch
4. Fastener sizes, quantities, locations, and spacing as specified in AF&PA “Wood Frame Construction Manual for One and Two-Family Dwellings.”

B. Wood Screws: Flat head carbon steel, FS FF-S-111.

C. Through Bolts, Lag Bolts, Lag Screws: Hex head steel bolts and screws per ANSI B18.2.1.

1. Provide nuts and washers of same materials as bolts.

D. Hot-Dip Galvanized Fasteners: ASTM A153.

1. Minimum Coating Designation: G60
2. Minimum Coating Designation Where Materials are Used in Contact with Preservative Treated Lumber: G185.

E. Power-Driven Fasteners: CABO NER-272.

F. Epoxy Anchors: High strength two-part adhesive epoxy system designed to install reinforcing steel and threaded studs into solid concrete base materials, and complying with ASTM C881.

1. Type: IV.
2. Grade: 3.
3. Class: A, B, C (except gel times).
4. Approved Product: Hilti, Inc., “HSE 2411 Epoxy Adhesive Anchor.”
5. Approved Product: Hilti, Inc., "HVA System."

G. Sleeve Anchors: Mechanical expansion bolts consisting of an externally threaded stud with a full length expanding sleeve for post-installation in hollow and solid concrete and masonry base materials.

1. Conforming to Federal Specification FF-S-325, Group II, Type 3, Class 3, for expansion shield anchors.
2. Zinc Plating: ASTM B633, Sc. 1, Type III.
3. Sleeve Anchor Diameter: 3/4 inch (5/8 inch bolt), unless indicated otherwise.
4. Head Type: Hex head.
5. Minimum Embedment: 2 inch, unless indicated otherwise.

6. Provide stainless steel anchors where connection will be subject to moisture.
7. Approved Product: Hilti Inc., “Sleeve Anchor.”

H. Expansion Anchors (Wedge Bolts): Stud type steel expansion anchors with a single piece, three section wedge for post-installation in solid concrete and fully grouted concrete masonry base materials.

1. Conforming to Federal Specification FF-S-325, Group II, Type 4, Class I, for concrete expansion anchors.
2. Zinc Plating: ASTM B633.
3. Bolt Diameter: 3/4 inch, unless indicated otherwise.
4. Nut Type: Hex nut matching bolt material.
5. Minimum Embedment: 3-1/2 inches, unless indicated otherwise.
6. Provide stainless steel anchors where connection will be subject to moisture.
7. Approved Product: Hilti, Inc., “Kwik Bolt III.”

I. High-Strength Concrete and Masonry Screw Anchors: Threaded, self-undercutting, non-expansion, removable screw anchors for concrete and masonry applications.

1. Material: Heat-treated carbon steel.
2. Zinc Plating: ASTM B633.
3. Approved Product: Simpson Strong-Tie, “Titen HD Anchor.”
4. Approved Product: Hilti, Inc., "Kwik-Con II Masonry Screw Anchor."

J. Miscellaneous Metal Framing Connectors: Galvanized steel connectors made from hot-dipped, zinc-coated steel sheet complying with ASTM A653, manufactured specifically for use in wood frame construction, selected and sized as appropriate for the members being joined and the use intended in strict accordance with the manufacturer’s written product selection recommendations, load tables, and installation instructions.

1. Include all fasteners and accessories as required by the manufacturer.
2. Use only fasteners approved by the connector manufacturer.
3. Minimum Zinc Coating Designation: G60 (except use G185 where fasteners are used in contact with preservative treated wood).

2.03 TAPES, SEALANTS, AND ADHESIVES

A. Sheathing Tape: Pressure-sensitive film tape coated with permanent adhesive for sealing joints and penetrations in sheathing and recommended by sheathing manufacturer for use with the types of sheathing required.

1. Do not use duct tape or masking tape.
2. Approved Product for Sealing XPS Surfaces: Siga,” Wigluv.”
3. Approved Product for Sealing XPS Surfaces: Siga,” Sicrall.”
4. Approved Product for Sealing Foil-Faced Polyisocyanurate Surfaces: Venture, “1585CW-P2.”
5. Approved Product for Sealing Foil-Faced Polyisocyanurate Surfaces: Nashua, “Waterproofing Repair Tape.”
6. Approved Product for Sealing Foil-Faced Polyisocyanurate Surfaces: Polyken, “Shadowlastic.”
7. Approved Product for Sealing Foil-Faced Polyisocyanurate Surfaces: Siga,” Wigluv.”

B. Single-Component, High-Performance, Polyurethane Sealant: ASTM C920.
   1. Type: S (single component).
   2. Grade: NS (nonsag).
   3. Class: 25.
   4. Uses Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: M, A, and as applicable to joint substrates indicated, O.
   6. Maximum VOC Content: 100 grams per liter.
   7. Approved Product: Bostik, Inc., “Chem-Calk 2000.”
   8. Approved Product: ChemRex, Inc., “Sonneborn NP-1.”

C. Construction Adhesive: ASTM D3498, low-solvent, elastomeric adhesive approved for use with materials joined per the material manufacturers’ recommendations.
   1. Minimum Shear Strength: 450 pounds per square inch.
   2. Use only products with all-weather (interior and exterior) performance and freeze-thaw stability.
   3. Maximum VOC Content: 140 grams per liter.
   4. Approved Product: Franklin International, Titebond “Premium Polyurethane Construction Adhesive.”
   5. Approved Product: Bostik, Chem-Calk “Heavy Duty Polyurethane Construction Adhesive.”
   6. Approved Product: Henkel Corporation, "Loctite, PL Premium Construction Adhesive."
   7. Approved Product: Red Devil, Inc., Solvent Free Construction Adhesive, Product No. 0776.

2.04 INDUSTRIAL PULTRUDED STRUCTURAL GRATING (ISOFR)

A. Industrial pultruded grating capable of supporting floor loads in span direction.
   1. Nonconductive, lightweight material manufactured from a fire-retardant Isophthalic polyester resist system (ISOFR) that is corrosion and slip resistant.
   2. Provide materials meeting the combustibility requirements for Class A, tested in accordance with ASTM E84, exhibiting a maximum flame spread index of 25 and a maximum smoke developed index of 450.
   3. Grating Depth: 1-1/2 inches.
   4. Grating Span: 4 feet.
   5. Minimum Recommended Load Capacity at 4-Foot Span: 1,760 pounds per square foot.
   6. Color: Safety yellow.
   7. Approved Product: Fibergrate Composite Structures, Inc., Safe-T-Span ISOFR, Series I5015.

2.05 MISCELLANEOUS FLASHING AND WATERPROOFING MATERIALS

A. Aluminum Flashing: ASTM B209.
   1. Minimum Thickness: 0.032 inches (20 gage).
   2. Alloy: 3003.
   3. Temper: H14.
   4. Finish: AA-C22A41, clear anodized.

5. Finish: High-Performance Organic Finish: Two-coat thermocured system with fluoropolymer topcoats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.

B. Pan Flashing: Pre-manufactured, flexible, ABS or PVC plastic pan flashing for window and door openings, with seamless injection molded corners that completely wrap the sub-floor/sill plate, and with a back dam that prevents intrusion of water into the interior of the wall, directing water to the exterior.

1. Approved Product: The Dow Chemical Company, “Weathermate Sill Pan.”
2. Approved Product: Jamsill, Inc., “Jamsill Guard.”

C. Flexible Flashing (Self Adhering Waterproof Barrier Membrane): Rubberized asphalt and polyethylene self-adhering sheet membrane conforming to ASTM D1970, cold-applied membrane composed of a high density, cross laminated polyethylene film coated on one side with a layer of rubberized asphalt adhesive.

1. Minimum Thickness: 40 mils (tested per ASTM D3767, Method A).
2. Minimum Tensile Strength: 250 pounds per square inch (tested per ASTM D412, Die C).
3. Minimum Elongation to Ultimate Failure: 250 percent (tested per ASTM D412, Die C).
4. Low Temperature Performance: Unaffected at negative 20 degrees Fahrenheit. (tested per ASTM D1970).
5. Minimum Adhesion Strength (to plywood): 3.0 pounds per inch of width (tested per ASTM D903).
6. Maximum Permeability: 0.05 perms (tested per ASTM E96).
7. Maximum Installed Material Weight: 0.3 pounds per square foot (tested per ASTM D461).
8. Approved Product: W. R. Grace & Co., “Ice & Water Shield.”
9. Approved Product: GAF Materials Corp., “Weatherwatch.”
10. Approved Product: Tamko Roofing Products, Inc., “Moisture Guard.”

D. Rubberized Asphalt (or Butyl) and Polyethylene Waterproof Barrier Membrane Flashing (for use in window and door flashing): Cold-applied, self-adhering membrane consisting of a 3 mil thick, high-density, cross laminated polyethylene film coated on one side with a 22 mil layer of rubberized asphalt or butyl adhesive.

1. Minimum Thickness: 25 mils.
2. Approved Product: Grace Construction Products, “Vycor Plus.”
3. Approved Product: Tamko Roofing Products, Inc., “Moisture Wrap.”
4. Approved Product: Dupont, Tyvek, “FlexWrap,” "StraightFlash," or "StraightFlash VF," as applicable.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Erect wood blocking true to level and/or plumb as applicable.

1. Securely nail or bolt wood members in place to insure stability and rigidity.
2. Use full-length wood framing members without splices.

B. Provide supplementary wood framing, furring, blocking, backing, and bracing for support of all fixtures, equipment, finishes, sidings, trims, grab bars, toilet accessories, furnishings, and similar construction.
   1. Securely anchor supplementary framing, furring, blocking, backing, and bracing in place.
   2. Use fire retardant treated wood in noncombustible construction.

C. Provide miscellaneous flashings and waterproofing as detailed and in accordance with the flashing material manufacturer’s instructions.

3.02 FIRE-RETARDANT-TREATED WOOD INSTALLATION

A. Comply with the manufacturer’s published installation instructions and limitations.

B. Avoid prolonged exposure to moisture during storage, handling, and throughout the construction period.

C. Do not alter, modify or install fire-retardant-treated wood in any way that is contrary to the manufacturer’s written instructions.

D. Notify the Architect prior to material procurement and installation if applications indicated in the Construction Documents are contrary to those allowed by code or those indicated in the material manufacturer's product literature.

E. Do not rip or mill fire-retardant-treated solid lumber unless specifically indicated as allowed in the manufacturer’s published literature.

F. Use fasteners approved in the fire-retardant-treated wood manufacturer’s written literature.

3.03 MISCELLANEOUS FLASHING, SEALING, AND WATERPROOFING INSTALLATION

A. Prepare openings for installation of exterior windows, doors, and skylights in accordance with the requirements of this Section and ASTM E2112.

B. Apply rubberized asphalt and polyethylene waterproof barrier membrane flashing around the perimeter of all exterior windows and doors in wood framing, between the sheathing and the nailing flange and at other locations where joints, seams, holes, and other undesirable openings exist in wall sheathing systems.
   1. Follow manufacturer’s instructions.
   2. See installation diagram at the end of this Section (door application similar to that shown for windows).

C. Seal all joints and penetrations to the exterior of the building, and to un-insulated interior spaces.
   1. Use sealing tapes, foams, and Elastomeric sealants, as applicable.

3.04 PROTECTION OF CONSTRUCTION

A. Protect wood from excessive exposure to moisture after erection.
   1. Where wood has been exposed to rain, snow, or other forms of moisture, allow enough time after weathering-in for the wood to completely dry.
   2. Do not conceal framing cavities or apply finishes until wood framing is completely dry.

3. Remove and replace materials which have been distorted or otherwise damaged due to moisture exposure.

END OF SECTION

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SECTION 06 40 00

FINISH CARPENTRY AND ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Fire-Retardant Treated Wood Sheathing and Blocking: Section 06 10 00 “Rough Carpentry”

B. Sealants for Woodwork and Other Interior Finishes: Section 07 92 00 “Joint Sealants”

C. Door Hardware: Section 08 71 00 “Door Hardware”

1.02 REFERENCES

A. AHA (American Hardboard Association)
   1. A135.4 “Basic Hardboard” (ANSI/AHA A135.4)

B. ANSI (American National Standards Institute)
   1. A208.1 “American National Standard for Mat-Formed Wood Particleboard”
   2. A208.2 “American National Standard for Medium Density Fiberboard (MDF) for Interior Applications”
   3. B18.2.1 “American National Standard for Square and Hex Bolts and Screws”

C. ASTM (ASTM International)
   1. A153 “Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”
   2. D5319 “Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels”
   3. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"
   4. F1667 “Standard for Driven Fasteners: Nails, Spikes, and Staples”

D. AWI (Architectural Woodwork Institute)
   1. AWS “Architectural Woodwork Standards”

E. BHMA (Builders Hardware Manufacturers Association)
   1. A156.9 “American National Standard for Cabinet Hardware” (ANSI)
   2. A156.18 “American National Standard for Recommended Practices for Materials and Finishes” (ANSI)

F. CABO (Council of American Building Officials)
   1. NER-272 “Pneumatic or Mechanically Driven Staples, Nails, P-Nails and Allied Fasteners for Use in All Types of Building Construction”

G. FS (Federal Specification)
   1. FF-S-111 “Screw, Wood”
   2. MMM-A-130 “Adhesive, Contact,” Revision B, 1974, and Amendment 3, 1976

H. LMA (Laminating Materials Association)

1. SAT-1 “Voluntary Product Standard and Typical Physical Properties of Saturated Paper Overlays”

I. NEMA (National Electrical Manufacturers Association)

1. LD 3 “High-Pressure Decorative Laminates”

J. NHLA (National Hardwood Lumber Association)

1. G-101 “Rules for the Measurement and Inspection of Hardwood and Cypress”

1.03 SUBMITTALS

A. Submit Shop Drawings.

1. Casework and cabinetry.

B. Submit Product Data.

1. Fiberglass Reinforced Plastic Panels.
2. Cabinet Hardware and Accessories.
3. Fire test data and affidavits required by Authorities Having Jurisdiction for exposed materials, assemblies, and finishes demonstrating compliance with code-required maximum allowable flame spread and smoke-developed index ratings.

C. Submit Samples.

1. Plastic laminate finishes.
2. Plastic laminate edge profiles and finishes.
3. Fiberglass reinforced plastic panel finishes.
4. Cabinet hardware.
5. Cabinet hardware exposed finishes.

1.04 QUALITY ASSURANCE

A. Comply with AWI AWS for all architectural woodwork and casework.

1. Grade: Custom.

B. Provide “Class III (C)” (per ASTM E84) rated plastic laminate casework assemblies in rooms and spaces.

1. Maximum Flame Spread Index: 200, per ASTM E84 (Class III).
2. Maximum Smoke Developed Index: 450, per ASTM E84 (Class III).
3. Provide affidavits substantiating classification if requested by the authorities having jurisdiction.

C. Do not use materials containing urea-formaldehyde, asbestos, lead, or other toxic or carcinogenic substances.

1.05 PROJECT CONDITIONS

A. Do not deliver or install woodwork until building is enclosed, wet work is complete, and temperature and relative humidity are maintained at levels planned for building occupants during the remainder of the construction period.

PART 2 PRODUCTS

2.01 SOLID, SAWN LUMBER

A. Hardwood Lumber: NHLA G-101.

1. Graded in accordance with AWI AWS: Custom.
2. Maximum Moisture Content at Time of Installation: 6 percent.

B. Hardwood Species: Hard Maple (acer saccharum, acer nigrum).

2.02 MANUFACTURED WOOD PANELS

A. Particleboard: ANSI A208.1; AWI AWS, industrial particleboard composed of wood particles of various sizes that are bonded together with waterproof, synthetic resin binders under heat and pressure.
   1. Density: Medium.
   2. Grade: M-2.
   3. Finish: Sanded faces.
   4. Thickness: 3/4 inch, unless indicated otherwise.
   5. Provide fire-rated (FR) particleboard, certified per ASTM E84, in assemblies where required to achieve fire rating class (flame spread, smoke-developed) indicated.
   6. Do not use materials containing urea-formaldehyde.

B. Medium Density Fiberboard (MDF): ANSI A208.2; AWI AWS, composite panels consisting of cellulosic fibers combined with a synthetic resin or other suitable bonding system and joined together under heat and pressure.
   1. Use: Interior.
   2. Grade: MD (Medium Density).
   3. Thickness: 3/4 inch, unless indicated otherwise.
   4. Number of MDO Faces: One.
   5. Finish: Flat, smooth, and uniform.
   6. Do not use materials containing urea-formaldehyde.

C. Perforated Hardboard (Pegboard): AHA A135.4; Prefinished, pressed wood fiber with resin binder, with predrilled holes in a continuous pattern.
   1. Class: 1 – Tempered.
   2. Thickness: Nominal 1/4 inch thick, unless noted otherwise.
   3. Sheet Size: 48-inches by 96-inches (4x8 feet).
   4. Hole Diameter: 9/32-inch (nominal 1/4-inch).
   5. Hole Pattern: 1-inch by 1-inch.
   6. Number of Holes: 4,608 holes per 48-inch by 96-inch sheet.
   7. Finish: smooth one side (S1S), prefinished “white” on one side.
   8. Do not use materials containing urea-formaldehyde.
   9. Provide wall-mounting stand-offs (spacers) providing 3/4-inch clearance behind panels, and all fasteners and washers required for a complete installation.
   10. Provide wall mounting hardware as required to support a minimum vertical load of 10 pounds per square foot, applied to panels.
   11. Peg hooks will be provided by the Owner.

2.03 PLASTIC LAMINATE

A. Thermoset Decorative Overlay (TDO) (Melamine Board): Particleboard or medium-density fiberboard (MDF) with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1, low pressure decorative laminate (LPDL).

1. Fire Resistance: Class A, per ASTM E84 (maximum Flame Spread Index of 25; maximum Smoke Developed Index of 450).

B. Plastic Laminate (P-LAM) (also known as HPDL, “high pressure decorative laminate”): NEMA LD 3, high-pressure decorative laminate (HPDL).

1. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate.
2. Core: Particleboard or medium density fiberboard (MDF).

C. Plastic Edge Trim: Extruded, PVC edge banding.

1. Thickness: 3 millimeters.
2. Width: Matching component panel/top thickness.
3. Finish: Smooth, with eased edges.
4. Color: Matching adjacent panel/top color.

D. Edge Trim for Shelves: Plastic laminate edge band to match faces.

E. Plastic Laminate and Edge Trim Adhesive: Contact Adhesive specifically approved by the plastic laminate and plastic edge trim manufacturer for use in the assemblies indicated.

1. Provide adhesive tested and approved for use in fire rated assemblies meeting fire resistance/flame spread class ratings required.
2. Maximum VOC content: 250 grams per liter.

2.04 FIBERGLASS REINFORCED PLASTIC

A. Fiberglass Reinforced Plastic (FRP) Wall Panels: Composite plastic panels complying with ASTM D5319.

1. Minimum Thickness: 0.09 inches.
2. Fire Resistance: Class C, per ASTM E84 (maximum Flame Spread Index of 200; maximum Smoke Developed Index of 450).
3. Finish: Embossed/pebbled..
4. Color: As indicated in the Drawings.
5. Approved Product: Kemlite (Div. of Crane Co.), “Glasbord-P with Surfaseal.”
6. Provide manufacturer’s standard vinyl trim moldings to meet project conditions and finish all exposed panel edges.
7. Provide adhesives recommended by the panel manufacturer to suit project conditions.

2.05 FASTENERS AND ADHESIVES

A. Screws: Fasteners: FS FF-S-111 (screws).

1. Size and type to suit application.

B. Nails and Staples: ASTM F1667.

1. Size and type to suit application.

C. Through Bolts, Lag Bolts, Lag Screws: Hex head steel bolts and screws per ANSI B18.2.1.

1. Provide nuts and washers of same materials as bolts.

D. Hot-Dip Galvanized Fasteners: ASTM A153.

1. Use galvanized fasteners in wet locations and where attachment is made to concrete or masonry substrates.

E. Power-Driven Fasteners: CABO NER-272.

F. Construction Adhesive: Low-solvent, structural, elastomeric adhesive approved for use with materials joined per the material manufacturers' recommendations.

1. Minimum Shear Strength: 450 pounds per square inch.
2. Use only products with all-weather (interior and exterior) performance and freeze-thaw stability.
3. Maximum VOC content: 140 grams per liter.
4. Approved Product: Franklin International, Titebond "Premium Polyurethane Construction Adhesive."
5. Approved Product: Bostik, Chem-Calk "Heavy Duty Polyurethane Construction Adhesive."

G. Adhesives for Use in Finish Carpentry: Polyvinyl-acetate (PVA), polyurethane, or cyanoacrylate glues as applicable to the substrates being joined and as appropriate to the service conditions anticipated.

1. Minimum Cured Strength: 3,000 pounds per square inch.
2. Use Type I (waterproof) or Type II (water-resistant) PVA glues as applicable to the substrates being joined and as appropriate to the service (moisture) conditions anticipated.
3. Use Type III (not water-resistant) PVA glues for applications in dry, interior areas only.

H. Contact Adhesive: Multi-purpose contact adhesive complying with FS MMM-A-130, as recommended and approved by the manufacturers of the materials being joined.

1. Maximum VOC content: 80 grams per liter.

2.06 CABINET HARDWARE AND ACCESSORIES

A. Hardware, General: Provide cabinet hardware and accessory materials for a complete installation of architectural woodwork, casework, and cabinetry.

B. Hardware Standard: BHMA A156.9.

C. Semi-Concealed Hinges for Overlay Doors : BHMA A156.9, B01521.

1. 5-knuckle overlay hinges, with hospital tips.
2. Grade: 1.
3. Height: 5-3/4 inches.
4. Minimum Opening Radius: 270 degrees.
5. Base Metal: Stainless Steel.
6. Finish: 26D (dull chrome plated).
7. Approved Product: RPC (Rockford Process Control), #374.

D. Wire Pulls: Back-mounted, nominal 4-inch long by 1-5/16 inch deep, 5/16 inch diameter formed, solid metal pulls.

1. Base Metal: Solid Brass.
2. Mounting Centers: 3-1/2 inches.
3. Finish: Satin chromium plated, US26D (BHMA 626, per BHMA A156.18).
4. Approved Product: Hafele America Co., 116.39.446.
5. Approved Product: Stanley, 348315.

E. Catches: Roller catch.

1. Approved Product: Amerock Corp., AM-BP9745-2G.

F. Adjustable Shelf Standards and Supports: Metal peg shelf supports, BHMA A156.9.
   1. Hole Diameter: 5 millimeters.
   2. Pin Length: 5/16 inch.
   3. Shelf Rest Dimensions: 5/16 inch wide by 7/16 inch long.
   4. Hole Spacing: 32 millimeters on-center.
   5. Finish: Bright chrome.
   6. Approved Product: Hafele “Metal Shelf Supports” Cat. No. 282.04.711.
   7. Approved Product: Knape & Vogt, 332 ANO.

G. Work Surface/Countertop Support Brackets: Pre-manufactured and pre-finished steel, 90-degree gusseted support brackets.
   1. Material: Powder-coated steel (ASTM A36 or equivalent).
   2. Minimum Material Thickness: 0.125-inch.
   3. Leg Dimensions: 24-inches by 24-inches.
   4. Hardware: Multiple mounting holes per side inch holes, accepting 1/4 inch screws.
   5. Spacing: 48-inch maximum.
   6. Finish: Almond powder-coat.
   7. Approved Product: Work Station Brackets (www.workstationbrackets.com) “24” X 24” Workstation Bracket,” Part #2424AMH.

H. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091.
   1. Box Drawer Slides: 100 foot-pounds.
   2. File Drawer Slides: 150 foot-pounds.
   3. Pencil Drawer Slides: 50 foot-pounds.
   4. Finish: Bright chrome.
   5. Provide drawer slides with smooth, easy operation; drawer slides that are stiff and not operating freely will not be accepted.
   6. Approved Product: Knape & Vogt, 1100/8400/8500 Series Full Extension.
   7. Approved Product: Accuride, 2600/3800/4000 Series Full Extension Drawer Slides.

I. Exposed Hardware Finishes: Complying with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Chromium Plated (US26D): BHMA 626 for bronze base; BHMA 652 for steel base.
   2. Verify that exposed cabinetry and casework hardware finishes match door hardware finishes and, where apparently conflicting finishes are specified, notify the Architect and request clarification prior to issuing submittals and procurement of materials.

J. Cable Grommets: Plastic material for trimming edges of round or rectangular cut-outs.
   1. Type: Two-piece grommets consisting of a desktop piece friction-fit into the work surface (completely concealing the cut work surface edges) and a removable, spring-loade top cover.
   2. Color: Match adjacent finishes as closely as possible, as approved by the Architect.
   3. Minimum Hole Size: 2 inches (50 millimeter) diameter, unless indicated otherwise by the Owner or Architect.
   4. Approved Product: Hafele “Cable Grommets” Cat. No. 429.99 series.

2.07 CASEWORK AND CABINETRY FABRICATION

A. Comply with AWI AWS for all architectural woodwork and casework fabrication.

B. Provide cabinet doors with enough hinges and adequate load-carrying capacity to fully support the doors under normal operation.

1. For doors less than 38 inches in height and up to 14 pounds in weight, provide 2 hinges per door.
2. For doors up to 60 inches in height and up to 30 pounds in weight, provide 3 hinges per door.
3. Do not install hinges spaced a distance less than the width of the door.

C. Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

1. Comply with the referenced AWI grade for interior woodwork and casework quality standard.
2. Shop cut openings to maximum extent possible.
3. Sand edges of cutouts to remove splinters and burrs.
4. Seal edges of openings in countertops with a coat of varnish.
5. Conceal all fasteners, except where specifically indicated to be exposed.

2.08 PLASTIC LAMINATE FABRICATION

A. Plastic Laminate Cabinets: Provide panels of high-pressure decorative laminate.

1. Grade for Horizontal Surfaces other than Tops: HGS.
2. Grade for Post-Formed Surfaces: HGP.
3. Grade for Vertical Surfaces: VGS.
4. Exposed Edges: PVC edge banding.
5. Semi-Exposed Surfaces Other than Drawer Bodies: Thermoset Decorative Overlay (Melamine Board).
6. Drawer Sides and Backs: Thermoset Decorative Overlay (Melamine Board).
7. Drawer Bottoms: Thermoset Decorative Overlay (Melamine Board).

B. Plastic Laminate Countertops: High-pressure decorative laminate.

1. Grade: HGS.
2. Exposed Edges: PVC T-mold.
3. Provide 4 inch high back and side splashes where indicated in the Drawings.

C. Edge Detail for Plastic Laminate Shelves: Plastic laminate edge band to match faces.

1. Install the edge banding on first and add the deck second, over the top of the edge band.

D. Edge Detail for Underside of Wall Cabinets: Type “B” Flush, per AWI AWS.

E. Shelf Standards: Multiple holes, aligned vertically, at 1-1/4 inches on center.

1. Provide 2 pegs at each end of each adjustable shelf and a single peg at mid-span at the back of the shelf (for all shelves greater than 30 inches long).

2.09 SHOP FINISHING

A. Finish architectural wood work at fabrication shop.

1. Defer only final touch-up, cleaning, and polishing until after installation.

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare for architectural woodwork and casework installation in accordance with AWI AWS, including proper delivery and storage of materials and components prior to and during installation.

B. Verify adequacy of bracing and support framing.

C. Condition woodwork and cabinetry to average prevailing humidity conditions in installation areas before installation.

1. Acceptable Relative Humidity Range: 25 percent to 55 percent.
2. Minimum Conditioning Period: 72 hours.

D. Verify acceptability of interior environmental conditions in installation areas before installation.

1. Do not proceed with installation until environmental conditions are within acceptable limits to avoid temperature and moisture-related problems in installed work.
2. Commencement of installation work constitutes the Contractor’s assurance that environmental conditions are within acceptable limits and that temperature and moisture-related problems will not occur.

3.02 INSTALLATION

A. Install wood trim materials in compliance with the recommendations of AWI AWS.

1. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches.
2. Shim as required with concealed shims.
3. Scribe and cut woodwork to fit adjoining work.
4. Refinish cut surfaces of prefinished members.

B. Install fiberglass reinforced plastic panels and trim materials in strict accordance with the manufacturer's installation instructions.

1. Provide and install all accessory items and trims as required for a complete installation.

C. Install plastic laminate sheets and trim materials in accordance with the manufacturer’s instructions.

1. Provide backspashes and sidespashes matching countertop material and finish.

D. Set and secure casework in place: rigid, plumb, and level.

1. Secure built-in casework using appropriate angles and anchorages.

E. Apply plastic laminate finish in full, uninterrupted sheets, consistent with manufactured sizes.

1. Fit corners and joints hairline and secure with concealed fasteners.
2. Mechanically fasten back and side splashes to countertops.

F. Use concealed fasteners in all “exposed to view” work, except where specifically indicated to be exposed and visible.

G. Provide cut-outs for embedded fixtures, conduits, and piping.

1. Verify locations of cut-outs and utility rough-ins from on-site dimensions.

H. Provide cutouts and grommets for passage of wiring through work surface tops.

1. Provide a minimum of one grommet for each 4 lineal feet of work surface top.
2. The Owner will indicate grommet locations after installation of casework.

3.03 SITE-ADJUSTMENT

A. Adjust moving or operating parts to function smoothly and correctly.

B. Make fine adjustments to casework installations as required to comply with fit, finish, and tolerances specified.

C. Maintain acceptable environmental conditions in installation areas throughout the finishing and curing period.

3.04 CLEANING AND PROTECTION

A. Thoroughly clean and protect work during curing of finishes and after completion.

END OF SECTION

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SECTION 07 21 00
THERMAL AND ACOUSTIC INSULATION

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Under-Slab Vapor Barriers: Section 07 26 00 “Air and Moisture Vapor Control”

B. Insulation for Pre-Engineered Metal Buildings: Section 13 34 19 “Metal Building Systems”

1.02 REFERENCES

A. ASTM (ASTM International)

1. C203 “Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation”
2. C209 " Standard Test Methods for Cellulosic Fiber Insulating Board"
3. C516 “Standard Specification for Vermiculite Loose Fill Thermal Insulation”
4. C578 “Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation”
5. C665 “Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing”
6. C1060 "Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings"
7. C1289 “Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board”
8. C1320 “Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction”
9. D1621 " Standard Test Method for Compressive Properties Of Rigid Cellular Plastics"
10. E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”
11. E96 “Standard Test Methods for Water Vapor Transmission of Materials”
12. E1186 "Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems"

B. ISO (International Organization for Standardization)

1. 6781 "Thermal insulation -- Qualitative Detection of Thermal Irregularities in Building Envelopes -- Infrared Method"

C. NFPA (National Fire Protection Association)

1. 285 “Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components”

1.03 DEFINITIONS

A. Building Enclosure: The system of three dimensional, multi-layer, multi-material parts and assemblies of any building that serve to physically separate the exterior environment from the interior environment(s), controlling heat flow, air flow, water vapor flow, rain (bulk water), ground water, light and solar radiation, noise and

vibrations, contaminants, environmental hazards and odors, building security, insects, rodents, vermin, and fire. Components of the building enclosure include, but are not necessarily limited to, the following above-grade and below-grade constructions and any connections, openings and penetrations therein:

1. Roofs.
2. Above-grade walls, including windows (fenestration) and doors.
3. Below-grade walls.
4. Base floors.

B. Building Envelope: See definition for "building enclosure" above.

C. Vapor Retarder: An element designed and installed in an assembly to retard the movement of water by vapor diffusion.

D. Vapor Permeable: having a vapor permittivity equal to or greater than 10 perms.

E. Semi-Vapor Permeable: having a vapor permittivity between 1 and 10 perms.
   1. Also known as a “Class III vapor retarder.”

F. Semi-Vapor Impermeable: a material having a vapor permittivity of between 1 perm and 0.1 perms (tested per ASTM E96, test method A).
   1. Also known as a “Class II vapor retarder.”

G. Vapor Barrier (vapor impermeable): a material having a vapor permittivity of 0.1 perms or less (tested per ASTM E96, test method A).
   1. Also known as a “Class I vapor retarder.”

H. Moisture Barrier: a material impervious to liquid moisture; a hygrophobic material.
   1. Also known as a "water-resistive barrier" (WRB).

I. Air Barrier: material having an air permeance not greater than 0.004 cubic feet per minute per square foot, under a pressure differential of 0.3 inches of water (1.57 pounds per square foot) when tested in accordance with ASTM E2178.
   1. Air barrier assemblies include the air barrier materials and accessories that provide a continuous designated plane to the movement of air through portions of the building enclosure.
   2. Continuous Air Barrier: The combination of interconnected materials, assemblies, and sealed joints and components of the building enclosure that minimize air leakage into or out of the building enclosure.
   3. Air barriers must be continuous to not allow opportunities for air leakage, they must be permanently secured to the supporting structure as required to withstand all applied pressures, and they must be durable enough to resist normal wear and weathering.

J. Continuous Insulation: Insulation that is continuous across all structural members of the building enclosure, without thermal bridges other than fasteners and service openings, and that minimizes thermal transmittance into or out of the building enclosure.

1.04 SYSTEM DESCRIPTION

A. Provide all insulation necessary to completely insulate the project, providing for all conditions indicated.

1. Plans and details for insulation are a schematic representation of the insulations at various locations and conditions on this Project.

B. Seal and insulate all openings and penetrations between conditioned spaces and non-conditioned spaces to prevent thermal transfer and the movement of air between them.

1. Provide construction prohibiting the flow of warm-air into attics and soffit spaces.

C. Provide insulation as required to meet or exceed the following minimum overall performance requirements, except where more stringent requirements are indicated elsewhere in the Drawings and/or Specifications:

1. Foundation Walls (from grade above to a depth of not less than 4 feet below grade): R-10.
2. Slabs-on-Grade: R-10 (from the inside face of exterior foundation walls to a line not less than 4 feet inboard).
3. Exterior Walls: R-9.8 continuous, R-25 cavity.
4. Roof/Ceilings: R-13 continuous, R-25 cavity.

D. Provide continuous insulation where it is indicated in the Drawings and/or Specifications and where it is required by local codes and Authorities Having Jurisdiction.

E. Do not use flammable foam plastic materials that will be left exposed in interior spaces or in attics and other interstitial spaces.

1. Provide code-required thermal barriers separating foam plastic materials from interior spaces.
2. Provide code-required ignition barriers separating foam plastic materials from attics and crawl spaces that are accessed for maintenance and service of utilities only.

F. Do not use materials containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds.

1.05 QUALITY ASSURANCE

A. Provide products and systems that are in compliance with the applicable building code and acceptable to all Authorities Having Jurisdiction over this Project.

B. Use applicators who are licensed and/or approved by the product and systems manufacturers used.

C. Exterior wall assemblies of Type I, II, II, and IV construction utilizing foam plastic insulations shall be tested in accordance with and comply with the acceptance requirements of NFPA 285, as applicable.

1.06 SUBMITTALS

A. Submit Product Data.

1. Insulation materials.
2. Insulation sealants, adhesives, fasteners, and tapes.

PART 2 PRODUCTS

2.01 RIGID INSULATIONS

A. Rigid Insulation (for foundation and slab insulation): Extruded polystyrene (XPS) sheet, ASTM C578.

1. Type: IV (1.55 pounds per cubic foot density and 25 pounds per square inch compressive strength).
2. Maximum Flame Spread Index: 75 (per ASTM E84).
3. Maximum Smoke Developed Index: 450 (per ASTM E84).
4. Thickness: 2 inches, unless indicated otherwise.
5. Edge Profile: Tongue and Groove.
6. Edge Profile: Square or tongue-and-groove.
7. Minimum Aged R-Value per Inch of Thickness: 5.0.

B. Rigid Insulation for Exterior Wall and Roof Sheathing Applications: Glass-fiber-infused polyisocyanurate (PISO) sheet per ASTM C1289, with 1.0 mil thick aluminum foil facing laminated on both sides.

1. Type: I.
2. Class: 2.
3. Use only materials bearing the PIMA (Polyisocyanurate Insulation Manufacturer’s Association) QualityMark Certification.
4. Use only materials which have been tested in applicable NFPA 285 wall assemblies and which are approved for use in exterior walls of buildings of any height.
5. Use only pentane-blown polyisocyanurate materials; do not use materials made with chlorofluorocarbon (CFC) or hydrochlorofluorocarbon (HCFC) blowing agents.
6. Minimum Compressive Strength: 25 pounds per square inch, per ASTM D1621.
7. Minimum Flexural Strength: 40 pounds per square inch, per ASTM C203.
8. Maximum Water Absorption: 0.1 percent by volume, per ASTM C209.
9. Maximum Flame Spread Index: 25 (Class A) (per ASTM E84).
10. Maximum Smoke Developed Index: 450 (per ASTM E84).
11. Thickness: 1-1/2 inches at walls and 2 inches at roof, unless indicated otherwise.
12. Minimum Aged R-Value per Inch of Thickness: 6.5.
13. Provide the rigid insulation manufacturer’s recommended nominal 3-inch wide sealing tape for all panel joints and intersections with adjacent materials.
14. Provide the rigid insulation manufacturer’s recommended expanding foam sealant for all penetrations, openings, gaps, and panel perimeter joints.
15. Approved Product: Dow Chemical Company, "Thermax Sheathing."

2.02 BATT INSULATIONS

A. Acoustic Insulation (Sound Attenuation Blankets) For Use in Frame Walls: Unfaced, friction-fit, preformed mineral fiber (slag wool, or rock wool) batts, ASTM C665.

1. Type: I.
2. Minimum Density: 2.5 pounds per cubic foot.
3. Maximum Flame Spread Index: 15 (per ASTM E84).
4. Maximum Smoke Developed Index: 0 (per ASTM E84).

5. Thickness: 3 inches, unless indicated otherwise.
6. Approved Product: Cetainteed, “Thermafiber Sound Attenuation Fire Blanket (SAFB)” 2.5 pounds per cubic foot, Creased.
7. Approved Product: IIG MinWool, LLC, “MinWool-1200 Sound Attenuation fire Batts.”
8. Approved Product: Roxul, Inc., “Roxul AFB,” Acoustical Fire Batt.
9. Approved Product: Owens Corning, “Sound Attenuation Fire Batts (Mineral Wool).”

2.03 INSULATION ACCESSORIES / MISCELLANEOUS

A. Sill Seal: Flexible, corrugated foam plastic strip, manufactured for use as a continuous gasket under sill plates.
   1. Thickness: 1/4 inch minimum, compressible to 1/32 inch.
   2. Width: Equal to width of sill plate.

B. Adhesives and Fasteners: Provide mechanical fasteners, adhesives, sealants, tapes, and other accessories as required for complete insulation installation.
   1. Provide corrosion-resistant metal fasteners with plastic or rubber washers where recommended by the insulation manufacturer.
   2. Provide adhesives with a demonstrated capacity to bond insulation securely to substrates indicated without damaging insulation and substrates.
   3. Provide sealants and tapes where required to produce moisture resistant and weather-tight insulating membranes, following the insulation manufacturer’s recommendations.

C. Expanding Foam Adhesive: Low-expansion foam adhesive manufactured for use in contact with the applicable construction materials joined, to provide material bond and to prevent passage of air, gasses, water, dust, fibers, and sound.
   1. Use the adhesive manufacturer’s approved application gun.
   2. Approved Product: Todol Products, Inc., “Pur Stick.”
   3. Approved Product: Dow “Great Stuff Pro” single-component insulating foam sealant/adhesive.

D. Rigid Board Insulation Sealing Tape: Pressure-sensitive film tape coated with permanent adhesive for sealing joints and penetrations in insulation boards and recommended by insulation manufacturer for use with the types of insulation boards required.
   1. Do not use duct tape or masking tape.
   2. Approved Product for Sealing XPS Surfaces: Siga,” Wigluv.”
   3. Approved Product for Sealing XPS Surfaces: Siga,” Sicrall.”
   4. Approved Product for Sealing XPS Surfaces: 3M,” All Weather Flashing Tape.”
   5. Approved Product for Sealing Foil-Faced Polyisocyanurate Surfaces: Venture, “1585CW-P2.”
   6. Approved Product for Sealing Foil-Faced Polyisocyanurate Surfaces: Nashua, “Waterproofing Repair Tape.”
   7. Approved Product for Sealing Foil-Faced Polyisocyanurate Surfaces: Polyken, “Shadowlastic.”
   8. Approved Product for Sealing Foil-Faced Polyisocyanurate Surfaces: Siga,” Wigluv.”

E. Sealing Mastic: Water-based, nontoxic, fiber reinforced, high-solids-content, elastomeric terpolymer emulsion sealing mastic.
   1. Application: Liquid-applied.

2. Maximum Flame Spread Index: 5 (tested per ASTM E84).
3. Maximum Smoke Developed Index: 0 (tested per ASTM E84).
4. Minimum Solids Content: 60 percent.
5. Maximum Permeability: 0.52 perms (tested per ASTM E96).
6. Approved Product: RCD Corporation, “PS-1 Mastic.”

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare surfaces to receive thermal or acoustic treatment to insure that substrates are acceptable to the respective material manufacturers.
   1. Remove materials and substances that are deleterious to adhesion, bond, or other performance characteristics of the respective materials.
   2. Do not proceed with application until all unsatisfactory conditions have been corrected.

B. Insure that environmental conditions are acceptable to the respective material manufacturers prior to applications.
   1. Do not install materials in conditions which are outside of the manufacturer's acceptable limits for moisture, temperature, and ventilation.
   2. Maintain acceptable environmental conditions during and after material applications, as required by the respective manufacturers.

C. Verify that physical characteristics of insulation materials and accessories are in compliance with required combustibility and flame spread limitations imposed by code.

3.02 INSTALLATION, GENERAL

A. Install all insulation and accessories in strict accordance with the manufacturer’s instructions.
   1. Insure that substrates and installation conditions are acceptable to the insulation manufacturers.

B. Completely fill all standard and non-standard cavities with insulation.
   1. No gaps are acceptable at tops, bottoms, or sides of cavities.

C. Cut and fit insulations accurately around obstructions and fill voids with insulation and seal all openings to prevent air infiltration.

D. Where plumbing piping is located in cavities adjacent to unconditioned spaces, provide high-R-value insulation between piping and the unconditioned space.

E. Fill all gaps and cracks between exterior window and door frames and rough openings, using low-expansion spray foam insulation to insure continuous insulation and weather tightness.

F. Insulate all band joists and similar cavities where they are on exterior walls or adjacent to unconditioned spaces.

G. Insure that all insulated areas are completely dry, and that insulations are fully cured, prior to covering with gypsum board, sheathings, or other materials that may inhibit drying or fully curing.

H. Insure that spray-applied insulations are fully adhered to substrates, that thicknesses, coverages, and surface profiles are satisfactory, and that all cavities are air-sealed and insulated.

3.03 BATT INSULATION INSTALLATION

A. Batt Insulation Installation: Place snuggly within spaces, around cut openings, behind and around mechanical and electrical items within partitions, and tight to items passing through partitions.

1. Comply with ASTM C1320.

3.04 RIGID INSULATION INSTALLATION

A. Install rigid insulation board on the exterior walls as detailed.

1. Apply a continuous bead of compatible sealant on all interfacing panel edges to create a water-tight air barrier.
2. Set units in foam adhesive and tape all seams with sealing tape.

B. Install perimeter foundation rigid insulation board continuous on the interior and exterior side of all exterior walls and under concrete-slabs-on-grade as indicated.

1. Set units in foam adhesive and tape all seams with sealing tape.

3.05 MISCELLANEOUS INSTALLATION

A. Sill Seal Installation: Place corrugated side toward most irregular surface.

1. Place sealer strip continuously.
2. Butt all end and perpendicular joints tightly.
3. Do not overlap.
4. Impale sealer strip to fit snuggly over anchor bolts and other projections.

3.06 QUALITY CONTROL

A. The Owner may engage a qualified, independent testing firm to evaluate and quantify the performance of the building's thermal and acoustic insulation systems.

1. An infrared camera may be used to test the thermal resistivity of the building enclosure, in accordance with ASTM C1060.
2. Measurement of sound levels within interior spaces may be used to test the effectiveness of acoustic barriers and sound absorptive materials used in the building's wall, floor, and ceiling construction.
3. Cooperate with the testing firm in coordinating and performing tests ordered by the Owner.
4. The Contractor shall provide remedial work and/or removal and replacement, at no additional expense to the Owner, as required to correct construction that fails to meet the specified standards.

B. At such time as the building enclosure is insulated and the continuous air barrier is in place, the Owner may test the building using infrared thermography, blower-door, and other testing equipment.

1. The Contractor shall cooperate fully with the testing agency personnel, providing unhampered access to all areas of the building and insuring that all necessary closing, sealing, and insulating of openings in the building enclosure is accomplished.
2. Use infrared cameras with a resolution of 0.1 degree Centigrade of better.

3. Perform testing on the building enclosure in accordance with ISO 6781 and ASTM C1060.
4. Determine air leakage pathways using ASTM E1186.

END OF SECTION

SECTION 07 26 00
AIR AND MOISTURE VAPOR CONTROL

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Sill Seal Gaskets: Section 07 21 00 “Thermal and Acoustic Insulation”

1.02 REFERENCES

A. ACI (American Concrete Institute)
   1. 302.1R “Guide for Concrete Floor and Slab Construction”

B. ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers)
   1. 90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings”

C. ASTM (ASTM International)
   1. D1970 “Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection”
   2. D4397, “Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications”
   3. E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”
   4. E96 “Standard Test Methods for Water Vapor Transmission of Materials”
   5. E779 "Standard Test Method for Determining Air Leakage Rate by Fan Pressurization"
   6. E1643 “Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs”
   7. E1677 “Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls”
   8. E1745 “Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs”
   9. E2178 “Standard Test Method for Air Permeance of Building Materials”
   10. E2357 "Standard Test Method for Determining Air Leakage of Air Barrier Assemblies"

D. USACE (United States Army Corps of Engineers)
   1. "Air Leakage Test Protocol for Measuring Air Leakage in Buildings"

1.03 DEFINITIONS

A. Building Enclosure: The system of three dimensional, multi-layer, multi-material parts and assemblies of any building that serve to physically separate the exterior environment from the interior environment(s), controlling heat flow, air flow, water vapor flow, rain (bulk water), ground water, light and solar radiation, noise and vibrations, contaminants, environmental hazards and odors, building security, insects, rodents, vermin, and fire. Components of the building enclosure include, but are not necessarily limited to, the following above-grade and below-grade constructions and any connections, openings and penetrations therein:

1. Roofs.
2. Above-grade walls, including windows (fenestration) and doors.
3. Below-grade walls.
4. Base floors.

B. Building Envelope: See definition for "building enclosure" above.

C. Vapor Retarder: An element designed and installed in an assembly to retard the movement of water by vapor diffusion.

D. Vapor Permeable: having a vapor permittivity equal to or greater than 10 perms.

E. Semi-Vapor Permeable: having a vapor permittivity between 1 and 10 perms.
1. Also known as a “Class III vapor retarder.”

F. Semi-Vapor Impermeable: a material having a vapor permittivity of between 1 perm and 0.1 perms (tested per ASTM E96, test method A).
1. Also known as a “Class II vapor retarder.”

G. Vapor Barrier (vapor impermeable): a material having a vapor permittivity of 0.1 perms or less (tested per ASTM E96, test method A).
1. Also known as a “Class I vapor retarder.”

H. Moisture Barrier: a material impervious to liquid moisture; a hygrophobic material.
1. Also known as a "water-resistive barrier" (WRB).

I. Air Barrier: material having an air permeance not greater than 0.004 cubic feet per minute per square foot, under a pressure differential of 0.3 inches of water (1.57 pounds per square foot) when tested in accordance with ASTM E2178.
1. Air barrier assemblies include the air barrier materials and accessories that provide a continuous designated plane to the movement of air through portions of the building enclosure.
2. Continuous Air Barrier: The combination of interconnected materials, assemblies, and sealed joints and components of the building enclosure that minimize air leakage into or out of the building enclosure.
3. Air barriers must be continuous to not allow opportunities for air leakage, they must be permanently secured to the supporting structure as required to withstand all applied pressures, and they must be durable enough to resist normal wear and weathering.

J. Continuous Insulation: Insulation that is continuous across all structural members of the building enclosure, without thermal bridges other than fasteners and service openings, and that minimizes thermal transmittance into or out of the building enclosure.

1.04 SYSTEM DESCRIPTION

A. Provide air and moisture control components as part of an overall exterior building enclosure system, including foundations, soils and grading, landscaping, decks and pavements, structural components, sheathings, eaves and soffits, roofing, storm water control, (window and door) openings, insulations, air barriers, vapor retarders, moisture drainage planes, flashings, mechanical and electrical penetrations, sealants, fasteners, veneers, trims, claddings, and finishes designed and installed for proper building thermal and moisture control.

B. Provide all air and moisture control systems necessary to protect the building construction and occupants from damage at all conditions indicated.
   1. Plans and details for air and moisture control measures are a schematic representation of the requirements at all similar locations and conditions on this Project.

C. Provide all moisture protection necessary to prevent excessive moisture and humidity build-up within building components (walls, floors, ceiling cavities, etc.) and to prevent conditions supportive of mold and algae growth.

D. Seal and insulate all openings and penetrations between conditioned spaces and non-conditioned spaces to prevent thermal transfer and the movement of air between them.
   1. Provide construction prohibiting the flow of warm-air into attics and soffit spaces.

E. Do not seal building exterior envelope components such that they are incapable of drying to at least one side.
   1. Provide assemblies having enclosed cavities that are vapor permeable to at least one side.
   2. Where there are questions or concerns regarding the drying capability of construction assemblies that may be subject to wetting review construction assemblies design with the Architect.

F. Construct the building enclosure with a continuous plane of interconnected air barrier components (continuous air barrier) to control air leakage into and out of the conditioned spaces.
   1. Seal all penetrations and material joints that interface with the air barrier and insulated building enclosure.
   2. Maximum Allowable Air Infiltration for Materials Used in the Building Enclosure: 0.02 liters per second per square meter (L/sec*m^2) at 75 Pascals pressure (0.004 cubic feet per minute per square foot, at a pressure equivalent to 0.30 inches water), when tested in accordance with ASTM E2178, per ASHRAE 90.1.
   3. Maximum Allowable Air Infiltration for Assemblies used in the Building Enclosure: 0.20 liters per second per square meter (L/sec*m^2) at 75 Pascals pressure (0.039 cubic feet per minute per square foot, at a pressure equivalent to 0.30 inches water), when tested in accordance with ASTM E2357 or ASTM E1677, per ASHRAE 90.1.
   4. Maximum Allowable Air Infiltration for the Overall Building Enclosure: 1.27 liters per second per square meter (L/sec*m^2) at 75 Pascals pressure (0.250 cubic feet per minute per square foot, at a pressure equivalent to 0.30 inches water), when tested in accordance with USACE "Air Leakage Test Protocol for Measuring Air Leakage in Buildings," as based on ASTM E779.
   5. Maximum Allowable Whole Building Air Changes per Hour (Due to Building Enclosure Leakage) at 50 Pascals Pressure: 3.
   6. Where locations, configurations, materials, or details of the building enclosure and air barrier are not understood, submit a Request for Interpretation to the Architect for clarification prior to proceeding with the Work.
   7. Support air barrier components so as to withstand the maximum positive and negative air pressures to be placed on the building without displacement, damage, or degradation over the service life of the building, and transfer these loads to the building structure.

G. Seal air-tight all penetrations through floors, walls and ceilings.

1. Seal all penetrations through interior and exterior floor, wall and ceiling membranes, including non-fire-rated walls, to an air-tight condition.
2. Include penetrations by all architectural, structural, mechanical, electrical, and plumbing items.
3. Seal all joints in and between building materials comprising interior and exterior floor, wall and ceiling membranes.

1.05 SUBMITTALS

A. Submit Product Data.
   1. Vapor barrier materials.

PART 2 PRODUCTS

2.01 VAPOR BARRIERS

A. Concrete Under-Slab Vapor Barrier: Polyethylene sheet manufactured from only virgin resin, ASTM D4397.
   1. Minimum Thickness: 15 mils (wet).
   2. Maximum Vapor Permeability: 0.1 perms (per ASTM E96, test method A).
   3. Sealing Tape: Minimum 4 inch wide, pressure-sensitive tape as recommended by the vapor barrier manufacturer for sealing joints and penetrations in vapor barrier.
   4. Include self-adhering pipe boots, patching materials, and all installation accessories as recommended by the manufacturer.

B. Concrete Under-Slab Vapor Barrier: Multi-ply reinforced polyethylene sheet manufactured from only virgin resin, complying with ASTM E1745, Class A.
   1. Minimum Thickness: 15 mils.
   2. Maximum Vapor Permeability: 0.05 perms (per ASTM E96, test method A).
   3. Sealing Tape: Minimum 4 inch wide, pressure-sensitive tape as recommended by the vapor barrier manufacturer for sealing joints and penetrations in vapor barrier.
   4. Include self-adhering pipe boots, patching materials, and all installation accessories as recommended by the manufacturer.
   5. Approved Product: Epro, Inc., Ecoshield-E.
   6. Approved Product: Raven Industries, Inc., “VaporBlock 15.”
   7. Approved Product: Reef Industries, Inc., Griffolyn 15 Mil.
   8. Approved Product: Stego Industries, LLC, Stego Wrap.

2.02 UNDERLAYMENT MATERIALS

A. Self-Adhered Underlayment: Self-adhering secondary water barrier designed for use directly under sloped, standing seam metal roofs and conforming to ASTM D1970.
   1. Provide product having a watertight asphalt to asphalt lap system
   2. Provide product having all-temperature performance from negative 20 degrees Fahrenheit to positive 240 degrees Fahrenheit.
   3. Provide product having a minimum 3-inch wide selvedge edge for waterproof adhesion between underlayment courses.
   4. Provide products that are approved by the manufacturer for use directly over substrates used in this project and directly under metal roof panels used in this project.

5. Minimum Thickness: 45 mils.
6. Provide compatible primers, sealants, fasteners, and all accessory materials recommended by the underlayment manufacturer for proper product installation.
7. Approved Product: Owens Corning, “Titanium PSU 30.”
8. Approved Product: MFM Building Products Corp., “Ultra HT Wind & Water Seal.”

2.03 AIR AND MOISTURE VAPOR CONTROL ACCESSORIES / MISCELLANEOUS

A. Adhesives and Fasteners: Provide mechanical fasteners, adhesives, sealants, tapes, and other accessories as required for complete air and moisture vapor control installation.
   1. Provide corrosion-resistant metal fasteners with plastic or rubber washers where recommended by the membrane manufacturer.
   2. Provide adhesives with a demonstrated capacity to bond membranes securely to substrates indicated without damaging insulation and substrates.
   3. Provide sealants and tapes where required to produce moisture resistant and weather-tight membranes, following the insulation manufacturer’s recommendations.

B. Polyethylene Sheeting Sealing Tape: Self-adhesive tape products effective in sealing joints and penetrations in polyethylene sheeting, as recommended by the sheeting material manufacturer.
   1. Approved Product for Sealing Polyethylene Surfaces: Siga,” Wigluv.”
   2. Approved Product for Sealing Polyethylene Surfaces: Siga,” Sicrall.”
   3. Approved Product for Sealing Polyethylene Surfaces: Siga, "Rissan 60" (for interior use).
   4. Approved Product for Sealing Polyethylene Surfaces: Polyken, “Shadowlastic.”

C. Expanding Foam Sealant: Low-expansion, closed-cell urethane foam sealant manufactured for use in contact with the applicable construction materials joined, to prevent passage of air, gasses, water, dust, fibers, and sound.
   1. Use the sealant manufacturer’s approved application gun.
   2. Approved Product: Todol Products, Inc., “Pur Fill 1G.”
   3. Approved Product: Dow Chemical Company, "Froth-Pak Insulation."
   4. Approved Product: Dow Chemical Company, "Great Stuff Pro."

D. Sealing Mastic: Water-based, low VOC, nontoxic, fiber reinforced, high-solids-content, elastomeric terpolymer emulsion sealing mastic.
   1. Application: Liquid-applied.
   2. Maximum Flame Spread Index: 5 (tested per ASTM E84).
   3. Maximum Smoke Developed Index: 0 (tested per ASTM E84).
   4. Minimum Solids Content: 60 percent.
   5. Maximum Permeability Rating: 0.52 perms (tested per ASTM E96).
   6. Approved Product: RCD Corporation, “PS-1 Mastic.”

E. Provide all application tools and materials required for proper installation of air and moisture vapor control products and systems, including, but not limited to guns, rollers, sprayers, brushes, barricades, diagnostic and testing equipment.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Install all air control and moisture protection products, and accessories in strict accordance with the manufacturer's instructions.

1. Insure that substrates and installation conditions are acceptable to the respective manufacturers.

B. Cut and fit membranes accurately around obstructions and fill voids and seal all openings to prevent air infiltration.

C. Provide airtight ceiling assemblies where located immediately below a roof or unconditioned attic space.

1. Thoroughly and completely seal all perimeters, joints, and penetrations in ceiling assemblies to eliminate and prevent the passage of air between conditioned and unconditioned spaces.

3.02 VAPOR BARRIER INSTALLATION

A. Concrete Under-Slab Vapor Barrier Installation: Install vapor retarders in strict conformance with the manufacturer's installation instructions, ASTM E1643, and ACI 302.1R.

1. Place sheets on level, compact base material, in position with longest dimension parallel with direction of concrete pour.
2. Lap joints 6 inches minimum and tape and seal all joints with the vapor barrier manufacturer's recommended tape.
3. Verify that vapor barrier sheets are clean and dry at the time seam tape is applied.
4. Protect vapor retarder membranes from damage from reinforcing steel chairs, foot traffic, wheelbarrows and similar sources.
5. Repair all punctures and defects prior to placing concrete, using vapor barrier material, tapes, and sealants as recommended by the vapor barrier manufacturer.

3.03 QUALITY CONTROL

A. The Owner may engage a qualified, independent testing firm to evaluate and quantify the performance of the building's air and moisture barrier systems.

1. A blower door test may be used to test air infiltration through the building enclosure.
2. Measurement of moisture levels within building materials may be used to test the effectiveness of vapor retarders and vapor barriers used in the building enclosure.
3. Cooperate with the testing firm in coordinating and performing tests ordered by the Owner.
4. The Contractor shall provide remedial Work and/or removal and replacement of installed Work, at no additional expense to the Owner, as required to correct construction that fails to meet the specified standards.

B. At such time as the building enclosure is insulated and the continuous air barrier is in place, the Owner may test the building to verify that the air leakage rate of the building enclosure does not exceed 1.27 liters per second per square meter (L/sec*m^2) at 75 Pascals pressure (0.250 cubic feet per minute per square foot, at a pressure equivalent to 0.30 inches water), when tested in accordance with USACE "Air

Leakage Test Protocol for Measuring Air Leakage in Buildings," as based on ASTM E779.

1. Accomplish tests using both pressurization and depressurization.
2. Divide the average measured air leakage flow rate in both directions by in cubic feet per minute at 75 Pascals pressure (0.250 cubic feet per minute per square foot, at a pressure equivalent to 0.30 inches water) by the surface area of the building enclosure as defined by the continuous air barrier of the building, including roof or ceiling, walls, and floor to produce the air leakage rate in cubic feet per minute per square foot, at a pressure equivalent to 75 Pascals (0.30 inches water).
3. The Contractor shall cooperate fully with the testing agency personnel, providing unhampered access to all areas of the building and insuring that all necessary closing and sealing of openings in the building enclosure is accomplished.
4. The Contractor shall provide a responsible HVAC technician with the authority and qualifications to place the building HVAC system in the correct mode for the pressure test.
5. Do not test the building until verifying that the continuous air barrier is in place and installed without failures.

END OF SECTION

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SECTION 07 31 00
SHINGLE ROOFING

PART 1 GENERAL

1.01 REFERENCES

A. AAMA (American Architectural Manufacturers Association)
   1. 2604 “Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels”

B. ARMA (Asphalt Roofing Manufacturers Association)
   1. “Residential Asphalt Roofing Manual”

C. ASTM (ASTM International)
   1. B209 “Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate”
   2. D3462 “Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules”
   3. D4586 “Standard Specification for Asphalt Roof Cement, Asbestos-Free”
   4. E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”
   5. E96 “Standard Test Methods for Water Vapor Transmission of Materials”
   6. E108 “Standard Test Methods for Fire Tests of Roof Coverings”
   7. F1667 “Standard for Driven Fasteners: Nails, Spikes, and Staples”

D. NRCA (National Roofing Contractors Association)
   1. “Roofing and Waterproofing Manual”

E. SMACNA (Sheet Metal and Air Conditioning Contractors National Association)
   1. “Architectural Sheet Metal Manual”

1.02 PROJECT CONDITIONS

A. Do not install roofing materials in a manner, or during weather conditions, that could result in a reduction or voiding of the material manufacturers’ product warranties.

B. Do not install shingles on areas with slopes less than 2:12.

C. Do not install shingles in weather conditions which could result in failure or premature deterioration of roofing materials and accessories.
   1. Follow the roofing material manufacturers’ instructions and recommendations regarding precautions to be taken when installing shingles in cold, hot, windy, icy, or excessively damp weather.
   2. Where roofing installation is to take place in winter weather conditions, insure that all snow and ice is completely removed from roof deck surfaces prior to installation of underlayments and shingles.
   3. Protect roof decks and other substrates from damage due to exposure to excessive moisture or other adverse weather conditions.

1.03 WARRANTY

A. Minimum Roofing Manufacturer's Warranty Period: 15 years.

1.04 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: SMACNA "Architectural Sheet Metal Manual."

B. Roofing Standard: NRCA "Roofing and Waterproofing Manual."

C. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Exterior Fire-Test Exposure: Class A, per ASTM E108.

D. Provide roofing applications meeting the wind resistance requirements indicated in the Drawings, or if not indicated, as required by Authorities Having Jurisdiction (AHJ).

PART 2 PRODUCTS

2.01 UNDERLAYMENTS

A. Synthetic Roofing Underlayments: Woven or spunbonded polypropylene membrane specifically designed as a shingle roofing underlayment, and specifically approved by the shingle manufacturer for use in contact with the shingles.

1. Minimum Vapor Permeance: 5 perms (per ASTM E96, Method B).
2. Approved Product: VaproShield, LLC, "SlopeShield."
3. Approved Product: Nemco Industries, "Roof AquaGuard BREA."
4. Approved Product: GAF Materials, "Deck-Armor."

2.02 SHINGLES

A. Synthetic Slate Shingles: Manufactured shingles made from thermopolymer olefin compounds that consist mostly of recycled post-industrial waste, meeting ASTM D3462.

1. Maximum Flame Spread Index: 25, per ASTM E84 (Class I).
2. Maximum Smoke Developed Index: 450, per ASTM E84 (Class I).
3. Approved Product: Atlas Roofing Corp., Pinnacle Pristine Architectural Shingle, Signature Gold Shingle Series.

B. Ridge Shingles: Manufacturer's standard units matching field shingles.

2.03 FLASHING

A. Drip-Edge: Prefinished aluminum sheet per ASTM B209.

1. Minimum Metal Thickness: 0.025 inch (22 Gage).
2. Brake formed to provide a 3-inch roof deck flange and 1-1/2 inch fascia flange with a 3/8 inch drip at the lower edge.

2.04 FASTENERS AND ADHESIVES

A. Fasteners for Shingles: Corrosion-resistant roofing nails as recommended by the shingle manufacturer and complying with ASTM F1667.
   1. 11 or 12 gage roofing nails with barbed or deformed shanks and 3/8 inch to 7/16 inch diameter heads.
   2. Do not use staples.

B. Fasteners for Felt/Synthetic Underlayment: Aluminum, stainless-steel, or hot-dip galvanized steel wire with low profile capped heads or disc caps, 1-inch minimum diameter.
   1. Do not use staples or hammer-tack fasteners.

C. Asphalt Roofing Cement: ASTM D4586.
   1. Type: II.

2.05 FABRICATION

A. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA "Architectural Sheet Metal Manual" that apply to design, dimensions, metal types, and other characteristics of items.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply metal drip-edge around entire roof perimeter. Attach drip-edge with roofing nails (through the roof deck flange only) spaced 8 to 10 inches on center.
   1. Lap underlayment over eave (downslope edge) drip-edge.
   2. Apply rake drip edge over waterproof barrier membrane and felt underlayment.

B. Install metal flashings according to recommendations in ARMA "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA "Roofing and Waterproofing Manual."

C. Install single layer of felt/synthetic underlayment on roof deck.
   1. Lap sides a minimum of 4 inches over underlying course.
   2. Lap ends a minimum of 4 inches.
   3. Stagger end laps between succeeding courses at least 72 inches.
   4. Hand-nail underlayment with plastic cap nails, as specified above.

D. Repair tears and punctures in underlayment with waterproof sealant prior to installation of shingles.

3.02 SHINGLE INSTALLATION

A. Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA "Roofing and Waterproofing Manual."

B. Fasten shingle strips following the shingle manufacturer’s instructions, but with not less than 4 fasteners per strip.
   1. For individual shingles, use minimum 2 fasteners per shingle.
   2. Nail shingles within the acceptable nailing area as recommended by the shingle manufacturer.
   3. Nail Penetration into Substrate: 3/4 inch minimum unless required otherwise by the shingle manufacturer.
   4. Install nails with heads flat and flush with the top surface of the shingle, ensuring good adhesion of the sealer and preventing pop-throughs.

C. Overhang the shingles beyond the drip edge (eaves and rakes) by 1/2 inch to 3/4 inch.

D. Ridge Cap Shingle Installation: Maintain same exposure of cap shingles as roofing shingle exposure.
   1. Lap cap shingles at ridges to shed water away from direction of prevailing winds.
   2. Fasten with roofing nails of sufficient length to penetrate sheathing.

E. Do not fasten shingles or flashings so as to leave nail heads exposed.

3.03 ACCESSORIES INSTALLATION

A. Flashings Installation: Install all flashings in strict accordance with the manufacturer’s instructions, SMACNA “Architectural Sheet Metal Manual,” and NRCA "Roofing and Waterproofing Manual."

END OF SECTION

SECTION 07 71 00
ROOF SPECIALTIES AND ACCESSORIES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Fire-Retardant Treated Wood Blocking and Nailers: Section 06 10 00 “Rough Carpentry”

B. Roofing Materials and Trims for Pre-Engineered Metal Buildings: Section 13 34 19 “Metal Building Systems”

1.02 REFERENCES

A. ASTM (ASTM International)
   1. B221 “Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes”

B. NRCA (National Roofing Contractors Association)
   1. “Roofing and Waterproofing Manual”

C. SSPC (Steel Structures Painting Council)
   1. Paint 12 “Cold-Applied Asphalt Mastic (Extra Thick Film)”

1.03 SUBMITTALS

A. Submit Shop Drawings.
   1. Snow guard layout, configurations, dimensions, and details.

B. Submit Product Data.
   1. Snow guards.

C. Submit Warranty Documentation.
   1. Snow guards.

1.04 QUALITY ASSURANCE

A. Snow guard manufacturer to provide engineered design of snow guard system per each installation application indicted in the Drawings.

B. Provide weatherproofing and waterproofing of all rooftop accessories, equipment, supports, curbs, joints, and penetrations.
   1. Coordinate weatherproofing and waterproofing with all rooftop elements and the work of all trades.

1.05 WARRANTY

A. Minimum Snow Guard Warranty Period: 2 years.

PART 2 PRODUCTS

2.01 PIPE-STYLE SNOW GUARDS

A. Snow Guard Brackets: Solid, extruded or cast aluminum blocks per ASTM B221, held in place by supports clamped to vertical ribs of standing-seam roof.
   1. Use Products that do not penetrate the roof.

2. Aluminum Grade: 6061-T6.
3. Aluminum Finish: Mill.
4. Provide manufacturer's standard snow guard blocks fabricated to accept two 1-inch outside diameter pipes.
5. Approved Product: Alpine Snow Guards (Div. Of Vermont Slate & Copper Services, Inc.), ASG4025-AL snow guard system.

B. Snow Guard Bars: Extruded aluminum bar or tubing per ASTM B221.
1. Aluminum Grade: 6005-T5.
2. Outside Diameter: 1 inch.
3. Minimum Wall Thickness: 0.120 inch.
4. Aluminum Finish: Mill.
5. Approved Product: Alpine Snow Guards (Div. Of Vermont Slate & Copper Services, Inc.), Tubing for ASG4025-AL snow guard system.

C. Accessory Materials: Provide all accessory materials and fasteners as detailed and as required for a complete snow guard system installation, including, but not necessary limited to the following:
1. Ice Flags: 6000 Series Aluminum, 3-inches wide by length as determined by snow guard manufacturer. Provide one ice flag per each standing seam metal roof panel bay along entire length of pipe style snow guard installation.
2. Couplings: Snow guard manufacturer's standard.
3. End Caps: Snow guard manufacturer's standard.
4. End Collars: Snow guard manufacturer's standard.
5. Ferrules: Snow guard manufacturer's standard.
6. Thru-Ferrule Fasteners: Long-shaft, corrosion-resistant, Phillips flat head, concrete anchors with 500 pound minimum pullout resistance.
7. Mechanical Fasteners: Snow guard manufacturer's standard.
8. Adhesives, Sealants, and Gaskets.

2.02 PAD-STYLE SNOW GUARDS

A. General: Prefabricated, non-corrosive, gusseted snow guard units designed to be installed without damage to roof and complete with all accessories required for installation and anchoring.
1. Plastic Tab Type: Mill finish, 26 gage galvalume, designed for adhesive attachment to roof surface using silicone or polyurethane elastomeric sealant or adhesive tape, as recommended by the snow guard manufacturer.
2. Provide all accessory materials required for a complete installation, including fasteners, flashings, adhesives and sealants.
3. Approved Product: Alpine Snow Guards (Div. Of Vermont Slate & Copper Services, Inc.), "PD30."

2.03 MISCELLANEOUS MATERIALS

A. General: Provide accessory materials, fasteners, solder, welding, protective coatings, sealants, and other miscellaneous items as required for complete installation of sheet metal flashings, trims, and roof accessories.

B. Aluminum Extrusions: ASTM B221.
1. Alloy and temper as recommended by manufacturer for use and finish indicated.

C. Flexible Sheet Membrane Flashing: Non-reinforced elastic sheet membrane: neoprene synthetic rubber sheet, butyl synthetic rubber sheet, or EPDM synthetic rubber sheet, color: black, thickness: 50 to 65 mils.

D. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

E. Bituminous Coating: SSPC Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15 mil dry film thickness per coating.

F. Fasteners: Non-corrosive metal fasteners, compatible with substrates and materials being fastened, and recommended for application by manufacturers of the substrates and materials being fastened.
   1. Size fasteners to resist design loads indicated, including snow loads and loads from peak wind gusts.
   2. Provide concealed/blind fasteners where possible.
   3. Provide gasket-headed fasteners where water-tight seal is required.

G. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing.
   1. Provide permanently elastic, non-sag, nontoxic, non-staining tape.

2.04 FABRICATION

A. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-corrosive metal, and in thickness not less than that of metal being secured.

PART 3 EXECUTION

3.01 PREPARATION

A. Check building construction and verify that roof accessory manufacturers' products and details are compatible with substrates and conditions present.
   1. Verify as-built conditions for accuracy of fit of roof accessory products prior to their fabrication and installation.

3.02 INSTALLATION, GENERAL

A. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction to ensure that combined elements are waterproof and weather tight.
   1. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

B. Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.
   1. Comply with the manufacturer's instructions for material separation requirements.

3.03 PIPE STYLE SNOW GUARD INSTALLATION

A. Install snow guards according to manufacturer's written recommendations and NRCA "Steep Roofing Manual."
   1. Locate the first row of snow guards above the exterior building wall in locations indicated in the Drawings.

2. Locate brackets at 48 inches on center maximum.

3.04 PAD-STYLE SNOW GUARD INSTALLATION

A. Install snow guards according to manufacturer's written recommendations and NRCA "Steep Roofing Manual."

1. Unless otherwise indicated, locate snow guards within 4 inches of eave line, at center of standing seam metal roofing pans and on-center following the same spacing as that of the standing seam metal roofing seams.
2. Install pad-style snow guards in acceptable weather conditions as recommended by the snow guard manufacturer.
3. Apply pad-style snow guards to clean, acceptable substrates, as recommended by the snow guard manufacturer.
4. Pad-style snow guards are designed to work in conjunction with pipe-style snow guards, where the first row of pipe-style snow guards is located above the exterior wall and the pad-style snow guards are only resisting the lateral force of snow over the eave overhangs.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Control Joint Filler in Concrete Slabs: Section 03 30 00 “Cast in Place Concrete”

B. Fire Stopping Sealants: Section 07 80 00 “Fire-Resistant Assemblies”

C. Mechanical System Sealants: Mechanical/Electrical Sections

1.02 REFERENCES

A. ACI (American Concrete Institute)
   1. 504R “Guide to Joint Sealants for Concrete Structures”

B. ASTM (ASTM International)
   1. C794 “Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants”
   2. C834 “Standard Specification for Latex Sealants”
   3. C919 “Standard Practice for Use of Sealants in Acoustical Applications”
   4. C920 “Standard Specification for Elastomeric Joint Sealants”
   5. C1193 “Standard Guide for Use of Joint Sealants”
   6. C1311 “Standard Specification for Solvent Release Sealants”
   7. C1330 “Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants”
   8. D5893 “Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements”
   9. E90 “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements”

C. Bay Area Air Quality Management District (BAAQMD)
   1. Regulation 8, Rule 51 “Adhesive and Sealant Products”

D. South Coast Air Quality Management District (SCAQMD)
   1. Rule #1168 “Adhesive Applications”

1.03 SYSTEM DESCRIPTION

A. Specific sealant manufacturers and products listed as “Approved” in this Specification may be used subject to the following conditions:
   1. Products are approved and recommended by the sealant manufacturer for the substrates, adjoining finishes, and environmental conditions encountered in this Project.
   2. Applying contractor has extensive experience with installing the proposed products and recommends their use for the substrates, adjoining finishes, and environmental conditions encountered in this Project.

3. Products pass preconstruction field-adhesion testing conducted by the Contractor and sealant supplier using samples of the actual materials being used in the construction.
4. Products either come in standard colors that provide ample choices and are appropriate to the adjacent exposed finishes, or will be provided in custom colors at no additional cost to the Owner or Architect.

B. Provide joint sealants for interior and exterior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

C. Provide sealant at all expansion joints, control joints, and other joints where differential movement is possible.

D. Provide exterior sealant joints where dissimilar materials intersect and a water-tight condition is required, including (but not limited to) the following:
1. Joints between flashings and trims and adjacent materials.
2. Joints between window and door frames and trims and adjacent materials.
3. Joints between masonry and adjacent materials.
4. Joints between concrete and adjacent materials.

E. Provide interior sealant joints between adjacent materials, including (but not limited to) the following:
1. Joints between window and door frames and trims and adjacent finish materials.
2. Joints between casework and adjoining finish materials.
3. Joints between plumbing fixtures and adjoining materials.
4. Joints at door thresholds.
5. Joints and annular spaces at penetrations in floors, walls and ceilings.

F. Provide all substrate preparation recommended by the sealant manufacturer, including removal of deleterious materials, surface cleaning, masking, installation of backers, and application of primers.

G. Where joints between materials are wider than the maximum joint width recommended by the joint sealant manufacturer, remake the joint to allow for proper sealant joint application, or, as approved by the Architect, provide alternate trim materials to cover the joint.
1. Remake material joints and/or provide alternate trim materials to cover wide joints.

1.04 SUBMITTALS

A. Submit Product Data.
1. Sealants.
2. Backer rods, primers and other sealant joint system accessories.

B. Submit Samples.
1. Color samples for exposed sealants.

1.05 QUALITY ASSURANCE

A. Use sealants that have been tested in accordance with ASTM C794 and that are approved by their respective sealant manufacturers for proper adhesion to the specific joint substrates encountered in this Project.

B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to the specific joint substrates encountered in this Project according to the appropriate method in ASTM C1193.
   1. Document results of field-adhesion testing and furnish a copy to the Architect.
   2. Do not use products in applications which fail preconstruction field-adhesion testing.

C. The VOC content of adhesives and sealants used in interior applications shall be less than the current VOC content limits of SCAQMD Rule #1168, AND all sealants used as fillers must meet or exceed the requirements of the BAAQMD Regulation 8, Rule 51.
   1. Interior Architectural Sealant VOC Limit: 250 grams per liter maximum.
   2. Do not use sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, 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 of Exposed Joint Sealants: Select colors to match adjacent finishes from the sealant manufacturer's full range, unless indicated otherwise.
   1. Match color of adjacent finishes.
   2. Verify approval of color selections before proceeding with installation.

2.02 JOINT SEALANTS FOR EXTERIOR APPLICATIONS

A. Exterior horizontal traffic joints in cast-in-place concrete slabs: Single-component, non-sag silicone sealant for concrete conforming to ASTM D5893.
   1. Type: NS (nonsag).
   2. Low modulus, neutral curing.
   3. Approved Product: Dow Corning Corp., "888."

B. Exterior horizontal traffic joints in cast-in-place concrete slabs: Single-component, non-sag silicone sealant for concrete conforming to ASTM D5893.
   1. Type: SL (self-leveling).
   2. Low modulus, neutral curing.
   3. Approved Product: Dow Corning Corp., "890-SL."

C. Prefinished Metal Roofing, Wall Panel and Trim Sealants: Use products and assemblies specifically recommended by the metal panel and trim manufacturers.
   1. Sealant Tape: Pressure-sensitive, gray polyisobutylene compound sealant tape with release-paper backing.
   2. Joint Sealant: ASTM C920; as recommended in writing by metal wall panel manufacturer.

      Where joints will be visible, provide sealants in colors matching adjacent exposed finishes.
   3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

4. Bituminous Coating: SSPC Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15 mil dry film thickness per coating.

2.03 JOINT SEALANTS FOR INTERIOR APPLICATIONS

A. Interior perimeter joints between gypsum board, wood or composite trims, hollow metal frames, windows, and similar finish materials: Latex sealant conforming to ASTM C834.
   1. Type: P.
   2. Grade: NF.
   3. Maximum VOC Content: 250 grams per liter.
   4. Approved Product: Pecora Corp., “AC-20 +Silicone.”

B. Interior perimeter joints between plumbing fixtures, tiling, counter tops and similar finish materials: Single-component, mildew-resistant, neutral-curing silicone sealant conforming to ASTM C920.
   1. Type: S (single component).
   2. Grade: NS (nonsag).
   3. Class: 25.
   4. Uses Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and as applicable to joint substrates indicated, O.
   6. Formulated with fungicide and intended for in-service exposure to moisture, high humidity, and extreme temperatures.
   7. Maximum VOC Content: 250 grams per liter.
   8. Approved Product: Pecora Corp., “Pecora 898.”

C. Acoustical Sealant (for exposed and concealed joints): Nonsag, paintable, nonstaining latex sealant complying with ASTM C834 that effectively reduces airborne transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
   1. Maximum VOC Content: 250 grams per liter.
   2. Approved Product: Pecora Corp., “AC-20 FTR Acoustical and Insulation Sealant.”
   3. Approved Product: Grabber, Acoustical Sealant - GSCS.
   4. Approved Product: Specified Technologies Inc. (STI), SpecSeal Smoke N Sound Caulk.
   5. Approved Product: GOSS 824 Acoustical Sound Sealant.
   6. Approved Product: Titebond Acoustical Sound Sealant.

2.04 JOINT SEALANT BACKINGS

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. Cylindrical Sealant Backings: ASTM C1330.

1. Type: C (closed-cell material with a surface skin), O (open-cell material), or B (bi-cellular material with a surface skin), as approved by the joint sealant manufacturer for the joint application indicated.
2. Size and Density: As required to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape 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.
1. Provide self-adhesive tape where applicable.

2.05 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 joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.01 PREPARATION

A. Insure that substrates and atmospheric conditions are acceptable prior to application of sealants.
1. Test all applications on samples for acceptability before final application.

B. Clean out and thoroughly dry joints immediately before installing joint sealants.
1. Install sealants as soon as possible after cleaning and preparing joints.

C. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
1. Clean 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.
2. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean 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.

D. Prime joint substrates where recommended by joint-sealant manufacturer based on preconstruction joint-sealant-substrate tests or prior experience.
1. Apply primer to comply with joint-sealant manufacturer's written instructions.

2. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

E. 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.
   1. Remove tape immediately after tooling without disturbing joint seal.

F. Install sealant backings 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 sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

G. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

3.02 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
   1. Apply sealants in strict compliance with the manufacturer’s instructions.
   2. Apply sealants in the proper sequence within the construction process to insure proper performance, longevity, and appearance.
   3. 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 widths which allow for optimum sealant performance and movement capability.

B. Install sealants using proven techniques that 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 in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

C. Concrete Joint Sealant Standard: Comply with ACI 504R.

D. Acoustical Joint Sealant Application Standard: Comply with ASTM C919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

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 sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 5A in ASTM C1193, unless otherwise indicated.

F. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION

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SECTION 08 11 00 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
3. Division 08 Section "Door Hardware".
4. Division 08 Section "Access Control Hardware".
5. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, and ANSI/SDI A250.4 for physical performance level.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel reinforced core with no stiffener face welds.

a. Provide 18 gauge steel vertical reinforcements 6 inches apart and welded in place. Foamed in place polyurethane core is chemically bonded to all interior surfaces. No face welding is permitted.
b. Thermal properties to rate at a fully operable minimum U-Factor 0.374 and R-Value 2.53, including insulated door, Mercury thermal-break frame and threshold.

c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.378 and R-Value 2.5, including insulated door, kerf type frame, and threshold.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. CECO Door Products (C) Honeycomb Core - Regent Series.
2. CECO Door Products (C) Energy Efficient - Mercury Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally

broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16” positive thermal break and integral vinyl weatherstripping.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Manufacturers Basis of Design:

a. CECO Door Products (C) - SU Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

A. Metal Louvers: Door manufacturer's standard metal louvers unless otherwise indicated.

1. Blade Type: Vision proof inverted V or inverted Y.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide door manufacturers standard louver to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door

Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 08 11 00

SECTION 08 36 13
SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.01 REFERENCES

A. ASTM (ASTM International)
   1. A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”
   2. A780 “Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings”
   3. E283 "Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen"

B. NFPA (National Fire Protection Association)
   1. 70 “National Electrical Code”

1.02 SYSTEM DESCRIPTION

A. Provide sectional overhead doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
   1. Minimum Design Wind Load (uniform velocity pressure): 20 pounds per square foot, acting inward and outward.
   2. Maximum deflection of door in the horizontal position: 1/120 of door width.
   3. Maximum Air Infiltration Rate: 0.08 cubic feet per minute at 15 miles per hour, tested per ASTM E283.

B. Provide sectional overhead door components and operators capable of operating for not less than 10,000 cycles.

C. Provide sectional overhead door panels having a minimum calculated R-Value of 17.50.

D. Provide sectional overhead doors fully equipped for wired push-button operation and wireless remote control operation.

1.03 SUBMITTALS

A. Submit Shop Drawings.
   1. Including plans, elevations, sections, details, and attachment to other work.

B. Submit Product Data.
   1. Manufacturer’s product literature.

C. Submit Samples.
   1. Exposed finishes.

D. Submit Warranty Documentation.
   1. Sectional overhead door warranty.

1.04 QUALITY ASSURANCE

A. Provide door installation by individuals trained and authorized by the door manufacturer for both installation and maintenance of door units required for this Project.

B. Provide only electrical components, devices, and accessories listed and labeled as defined in NFPA 70.

1.05 WARRANTY

A. Minimum Overhead Door Warranty Period: 1 year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Products, meeting or exceeding these specifications, by the following manufacturers are acceptable:
   1. C.H.I Overhead Doors.
   2. Clopay Building Products, subsidiary of Griffon Corporation.
   3. Haas Door, A Nofziger Company.
   4. Overhead Door Corporation.
   5. Raynor Garage Doors.
   6. Wayne-Dalton Corporation.

2.02 STEEL DOOR SECTIONS

A. Construct door sections, including face sheets and frames from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A653.
   1. Minimum Coating Designation: G60.
   2. Minimum Panel Face Sheet Thickness: 0.015 inches.
   3. Exterior-Section Face: Manufacturer's standard stucco appearance with light ribbed embossed.

B. Fabricate door panels from a single sheet.
   1. Maximum Panel Height: 24 inches
   2. Nominal Panel Thickness: 2 inches.
   3. Provide thermal break construction.

C. Enclose open sections with channel end stiles formed from galvanized sheet steel.
   1. Minimum Sheet Steel Thickness: 0.064 inches (16 gage).

D. Provide reinforcement for hardware attachment.

E. Insulate inner core of steel sections with door manufacturer's standard polyurethane insulation.
   1. Do not use insulating materials containing chlorofluorocarbons (CFC's) or hydrochlorofluorocarbons (HCFC's).
   2. Enclose/encapsulate insulation completely within steel sections that incorporate the inside facing material, with no exposed insulation material evident.
   3. Inside Facing Material: Zinc-coated (galvanized) steel sheet.

F. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

G. Provide door manufacturer’s standard flexible weatherstripping.
   1. Flexible bulb-type strip at bottom of door section where contact is made with floor.
   2. Flexible jamb seals.
   3. Flexible header seal.

2.03 PANEL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Clean galvanized surfaces prior to finish application so surfaces are free of oil and other contaminants.
   1. Pretreat zinc-coated steel, after cleaning, with a conversion coating.

C. Apply manufacturer's standard primer to door faces after forming.

D. Apply manufacturer's standard finish coats to interior and exterior door faces after forming.
   1. Color and Gloss: As selected by the Architect from the manufacturer’s full range.

E. Provide manufacturer's standard, factory-applied finish paint coating to interior door faces.
   1. Color: White.

F. Where finish colors not included in the manufacturer’s standard colors is indicated in the Drawings, provide exterior finish paint coatings shop-applied by the door supplier, in custom finish color as selected by the Architect.
   1. Provide industrial-grade enamel finish paint coatings.
   2. Provide finish paint coatings to exposed exterior faces of doors

2.04 WINDOWS

A. Provide windows of type and size indicated, and in the arrangements shown.
   1. Glazing Material: Clear acrylic, fully tempered glass, or other, manufacturer’s standard, clear safety glazing material.
   2. Provide insulating glazing consisting of at least two panes with sealed interspace.

2.05 TRACKS AND SUPPORTS

A. Provide the door manufacturer’s standard galvanized steel track system, sized for door size and weight, designed for lift type indicated and clearances shown, including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door types and size.
   1. Door Track Size: 3-inch.
   2. Lift Type Configuration: High – to maximum lift clearance available.
   3. Weld or bolt tracks to track supports.

B. Provide galvanized steel supporting members of strength and rigidity required during opening and closing of doors.

2.06 HARDWARE

A. Provide heavy-duty, corrosion-resistant hardware to suit door type.

B. Provide heavy-duty galvanized steel hinges at each end stile and at each intermediate stile.
   1. Attach hinges to door sections through stiles and rails.
   2. Provide double-end hinges where required and for doors exceeding 16 feet in width.

C. Provide heavy-duty rollers with steel ball bearings in case-hardened steel races.
   1. Tire Material: Case-hardened steel.

2.07 COUNTERBALANCE MECHANISM

A. Fabricate torsion spring from oil-tempered-steel wire, mounted on a cross-header tube or steel shaft.
   1. Connect to door with galvanized aircraft-type lift cables with cable safety factor of at least 5 to 1.
   2. Provide springs calibrated for a minimum of 10,000 cycles.

B. Provide cast-aluminum or gray-iron casting cable drums grooved to receive cable.
   1. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft.

C. Provide anchor support brackets as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

2.08 ELECTRIC DOOR OPERATORS

A. Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycle requirements specified.
   1. Provide door operator accessories and mounting hardware required for proper operation.

B. Provide a hand-held disconnect device for automatically engaging chain-and-sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch.
   1. Manual operation is to be by continuous hand chain.
   2. Mount disconnect device and operator so they are accessible from floor level.
   3. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

C. Provide door operator units consisting of side-mounted, jackshaft type electric motorized operator for high-lift doors.
   1. Provide units for both right-hand-side and left-hand-side applications, as dictated by available clearances, adjacent construction, and other conditions.
   2. Provide center-mount motor in high-lift applications where there is insufficient clearance on both sides of the door to accommodate side-mounted assemblies.
   3. Provide floor level quick-release for manual operation.

D. Provide a hand-held disconnect device for automatically engaging chain-and-sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch.
   1. Manual operation is to be by continuous hand chain.
   2. Mount disconnect device and operator so they are accessible from floor level.
   3. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

E. Provide ac or dc control equipment, including transformers, as required.
   1. Coordinate electrical requirements with electrical design and electrical trades.

F. Provide high-starting torque, reversible, continuous-duty electric motors, with overload protection, sized to start, accelerate, and operate doors in either direction from any position.

1. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.

G. Provide momentary-contact, three-button control stations with labeled push button controls.
   1. Button Functions: “Open,” “Close,” and “Stop.”

H. Provide radio-frequency remote control door operators including receivers and transmitters with a unique frequency for each door.
   1. Button functions on hand-held transmitters: "Open" and "Close."
   2. Number of Receivers: One per door.
   3. Number of Battery-Operated Portable Transmitters: Two per door.

I. Provide automatic safety sensors capable of protecting the full width of each door opening.
   1. Activation of sensor immediately stops and reverses downward travel of door.

J. Provide adjustable limit switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

2.09 ACCESSORIES FOR SECTIONAL OVERHEAD DOORS

A. Provide overhead sectional doors with exhaust ports installed in the lowest panels on doors where indicated in the Drawings.
   1. Exhaust port material: Aluminum.
   2. Exhaust port opening size: 5-1/2 inch diameter.
   3. Provide exhaust ports that are compatible with sectional doors used and that are acceptable to the sectional door manufacturer, without adverse effect on the sectional door warranty.
   4. Provide exhaust ports with gaskets, covers, and all hardware required for a complete installation.
   5. Crushproof hoses, exhaust pipe/stack adapters, elbows, Y’s, and all other connecting pieces will be provided by the Owner.
   6. Approved Manufacturer: Fume-A-Vent Exhaust Removal Systems, division of Air Cleaning Specialists, Inc.

B. Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to all perimeter edges of each overhead door.

C. Provide continuous resilient garage door thresholds at all sectional overhead doors in exterior walls.
   1. Product Section: 3-inch wide by 1/2-inch high with center bulb and tapered sides.
   2. Provide units in one piece that are continuous across the entire sectional overhead door opening width.
   3. Color: Black.
   4. Provide all adhesives, sealants, and accessories recommended by the threshold manufacturer and as required for a complete installation.
   5. Approved Product: Elite Xpressions, LLC, Elite Garage Floors (www.elitegaragefloors.com), “Storm Shield Garage Door Threshold.”

PART 3 EXECUTION

3.01 INSTALLATION

A. Install door, track, and operating equipment complete with necessary hardware according to Shop Drawings, manufacturer's written instructions, and as specified.

B. Install exhaust ports in sectional overhead door panels per the recommendations of the exhaust port and the overhead door manufacturers.

C. Install thresholds per the recommendations of the threshold and the overhead door manufacturers.

1. Prepare floor surface as required to receive threshold.
2. Use epoxy adhesive for a continuous, water-tight, and durable bond between threshold and concrete floor.
3. Provide sealant joints at threshold ends as required to prevent intrusion of water and snow when door is in the closed position.

3.02 ADJUSTING

A. Lubricate bearings and sliding parts.

B. Adjust doors to operate easily, free of warp, twist, or distortion and with weathertight fit around entire perimeter.

C. Immediately after welding galvanized track to track supports, clean field welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A780.

3.03 DEMONSTRATION

A. Train the Owner’s maintenance personnel to adjust, operate, and maintain sectional overhead doors.

END OF SECTION

SECTION 08 53 13
VINYL WINDOWS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Membrane and Sheet Metal Flashings: Section 06 10 00 “Rough Carpentry”

B. Expanding Foam Insulating Sealant: Section 06 10 00 “Rough Carpentry”

C. Sealants: Section 07 92 00 “Joint Sealants”

D. Glazing Units: Section 08 80 00 “Glass and Glazing”

1.02 REFERENCES

A. ASTM (ASTM International)

1. E283 “Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen”
2. E330 “Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference”
3. E547 “Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential”
4. E2112 “Standard Practice for the Installation of Exterior Windows, Doors and Skylights”

B. NFRC (National Fenestration Rating Council)

1. 100 “Procedure for Determining Fenestration Product Thermal Properties”
2. 200 “Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence”

C. SMA (Screen Manufacturers Association)

1. 1004 “Aluminum Tubular Framing Screens for Windows” (ANSI)

D. WDMA (Window & Door Manufacturers Association)

1. 101/I.S. 2/NAFS “Voluntary Performance Specification for Windows, Skylights and Glass Doors” (ANSI, AAMA)

1.03 PERFORMANCE REQUIREMENTS

A. Provide window products certified by the National Fenestration Rating Council (NFRC).

B. Provide window units meeting the minimum standards of performance, materials, components, accessories, and fabrication of WDMA 101/I.S. 2/NAFS unless more stringent requirements are indicated.

C. Minimum Window Performance Class and Performance Grade (PG) (for all product types, sizes, and configurations indicated in the Drawings) per WDMA 101/I.S.

2/NAFS: Class LC - PG 20 (in size tested at least as large as the largest unit required for this Project), with the following additional minimum requirements:

1. Window Unit Air Leakage: 0.05 cubic feet per minute per square foot of frame or less when tested in accordance with ASTM E283 at 1.57 pounds per square foot (25 miles per hour).
2. Water Penetration: No water penetration when tested in accordance with ASTM E547 under static pressure of 7.5 pounds per square foot (49 miles per hour) after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot of window area.
3. Structural Strength: Window assemblies capable of withstanding positive and negative pressures of 75 pounds per square foot acting normal to the plane of the window, when tested in accordance with ASTM E330.
4. Deflection: Glass framing system designed to limit lateral deflections of glass edges to less than 1/175 of glass edge length at design pressure based on testing performed according to WDMA 101/I.S. 2/NAFS, Uniform Load Deflection Test, or structural computations.
5. Thermal Transmittance: Windows with a maximum whole-window unit U-value of 0.33 at 15 miles per hour exterior wind velocity and winter condition temperatures when tested in accordance with NFRC 100.
6. Solar Heat Gain Coefficient: Windows with a whole-window-unit SHGC maximum of 0.35, as determined according to NFRC 200.

D. Where multiple windows are mulled together, provide anchorages, reinforcements, and sealants required to maintain the performance standards specified above for the entire assembly of windows, taken as a whole.

E. Variance in window sizes indicated in the Drawings (height and width) is allowed to maximum plus-or-minus 1-1/2 inches, provided that no structural or aesthetic impact results due to variance in window size and provided that no additional cost for windows or any other work affected by the windows is incurred by the Owner due to variance in window size.

1.04 SUBMITTALS

A. Submit Shop Drawings.
   1. Window sizes and details.

B. Submit Product Data.

C. Submit Samples.
   1. Window finishes.

D. Submit Test Results.
   1. Documentation verifying compliance with test result standards specified.

E. Submit Warranty Documentation.
   1. Window components warranty.
   2. Repair and replacement labor warranty.

1.05 WARRANTY

A. Minimum Window Components Warranty Period: 10 years parts.

B. Minimum Repair and Replacement Labor Warranty Period: 2 years.

PART 2 PRODUCTS

2.01 MATERIALS

A. Frame and Sash: High-impact-resistance polyvinyl chloride (PVC).
   1. Minimum PVC thickness: 0.079 inches.
   2. Minimum Frame Depth: 4.5 inches.
   3. Exterior Exposed Surfaces: Manufacturer's standard prefinished white.
   4. Interior Exposed Surfaces: Manufacturer's standard prefinished white.
   5. Extension Jambs: Prefinished PVC trims matching window unit frames.
   6. Sills: Prefinished PVC stools matching window unit frames.

B. Glazing Configuration: Provide units with exterior insulating glass in configurations indicated in the Drawings.

C. Weatherstripping: Manufacturer's standard weatherstripping system meeting performance requirements specified.

D. Insect Screens: Black vinyl coated 18/16 mesh fiberglass or aluminum screen cloth set in aluminum frames complying with SMA 1004.
   1. Frame fitted to window frame, supplied complete with all necessary hardware.

E. Frame reinforcements, Anchors, Installation accessories, Flashings, Sealants, and Fasteners: Use materials indicated and as recommended by the window manufacturer.
   1. Where configurations or materials indicated in the Contract Documents differ from those recommended by the window manufacturer, notify the Architect in writing.
   2. Do not proceed with materials procurement or installation until Architect's response has been received.

2.02 GLASS & GLAZING

A. Provide factory-glazed window units (see Section 08 80 00).

2.03 HARDWARE

A. Provide manufacturer's corrosion-resistant hardware in styles and finishes indicated.
   1. Hardware Manufacturer: Truth Hardware.
   2. Hardware Finish: White.

2.04 FABRICATION

A. Fabricate vinyl windows, in sizes indicated, that comply with WDMA 101/I.S. 2/NAFS for performance class and performance grade indicated.
   1. Include a complete system for assembling components and anchoring windows.

B. Where the manufacturer's standard product sizes do not match the sizes indicated in the Drawings (within specified tolerances), provide custom sizes matching those indicated.

C. Provide full-perimeter weather stripping for each operable sash and ventilator, unless otherwise indicated.

D. Factory machine windows for openings and hardware that is not surface applied.

2.05 FINISHES

A. Exterior Finish: Manufacturer’s standard factory PVC finish, requiring no painting or maintenance.

1. Color: As indicated in the Drawings, and as approved by the Architect.

B. Interior Finish: Manufacturer’s standard factory PVC finish, requiring no painting or maintenance.

1. Color: As indicated in the Drawings, and as approved by the Architect.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that rough-framing work has been properly installed and that substrates to receive window units are acceptable to the window manufacturer for window installation.

1. Notify Architect of any problems with rough openings, framing conditions, or substrates prior to installation of windows.

B. Install moisture barrier membranes and flashings at rough openings to insure proper shedding of water to the building exterior.

1. Provide continuous pan flashings at window sills.

3.02 INSTALLATION

A. Install window units, hardware, operators, accessories and other window components according to window manufacturer's written installation instructions.

B. Where more specific instructions are not given by the window manufacturer, install exterior windows in accordance with ASTM E2112.

C. Set units plumb, level, true to line, and without warp or rack in frames or sash.

D. Install expanding foam insulating sealant in shim space around window perimeter to maintain continuity of building insulation and insure an air-tight seal.

1. Do not use high-expansion insulating sealant.

E. Separate corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in WDMA 101/I.S. 2/NAFS.

F. Use clips, installation fins, subsills, mullion reinforcements and covers, and other accessories and attachment devices as applicable and as recommended by the window manufacturer.

1. Provide corrosion-resistant installation fasteners in size, number, and spacing as recommended by the window manufacturer.

G. Install head, sill, and jamb flashings per window manufacturer’s instructions.

H. Seal flanges to adjacent sheathing with peel-and-stick rubberized asphalt flashing.

I. Seal exterior perimeter of window after exterior trim and finish is applied.

1. Install sealant and, if applicable, backer rod as recommended by the window and sealant manufacturer.
2. Seal all exposed intersections between window units and abutting materials except joints left open intentionally to function as weeps.

3.03 TESTING, CLEANING, AND REPLACEMENT

A. Test operable window units for proper operation.

1. Adjust moving parts as required.

B. Clean units and protect until final acceptance.

C. Replace defective parts/units.

END OF SECTION

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SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware Schedule”.
2. Division 08 Section “Hollow Metal Doors and Frames”.
3. Division 08 Section “Access Control Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Seven years for heavy duty cylindrical (bored) locks and latches.
3. Twenty five years for manual surface door closer bodies.
4. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Acceptable Manufacturers:

a. Bommer Industries (BO).
b. Hager Companies (HA).
c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
d. Stanley Hardware (ST).

B. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should comply with ANSI/BHMA A156.14.

1. Sliding Bi-Passing Pocket Door Hardware: Provide complete sets consisting of track, hangers, stops, bumpers, floor channel, guides, and accessories indicated.

2. Bi-folding Door Hardware: Rated for door panels weighing up to 125 lb.

3. Pocket Sliding Door Hardware: Rated for doors weighing up to 200 lb.

4. Acceptable Manufacturers:

a. Hager Companies (HA).
b. Johnson Hardware (JO).
c. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.3 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Acceptable Manufacturers:

a. Ives (IV).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
5. Acceptable Manufacturers:
    a. Ives (IV).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Manufacturer’s Standard.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).

F. Construction Keying: Provide construction master keyed cylinders.

G. Construction Keying: Provide temporary keyed construction cores.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

I. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Acceptable Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) – ML2000 Series.
b. Sargent Manufacturing (SA) – 8200 Series.
c. Stanley Best (BE) – 40H-UN Series.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.

1. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

2. Locks are to be non-handed and fully field reversible.

3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.

4. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) – CL3300 Series.
b. Sargent Manufacturing (SA) – 10 Line.
c. Stanley Best (BE) – 9K Series.

2.6 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.7 ELECTRIC STRIKES

A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 3000 lbs. of static strength and 350 ft-lbs. of dynamic strength. Strikes tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Acceptable Manufacturers:

    a. HES (HS).

2.8 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - DC6000 Series.
b. LCN Closers (LC) – 1450 Series.
c. Norton Door Controls (NO) - 8500 Series.
d. Sargent Manufacturing (SA) - 1431 Series.

2.9 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
3. Reese Enterprises, Inc. (RE).

2.10 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.11 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Manufacturer’s Abbreviations:

1. HA - Hager
2. PE - Pemko
3. IV - Ives
4. RU - Corbin Russwin
5. TC - Trimco
6. HS - HES
7. RO - Rockwood
8. GJ - Glynn-Johnson
9. LC - LCN Closers

10. NG - National Guard
11. SU - Securitron
12. MK - McKinney
13. OT - OTHER

Hardware Sets

Set: 01

Door: 104.1

3 Hinge	BB1279	US26D	HA	087100
1 Passage Set	CL3310 NZD	626	RU	087100
1 Surface Closer	1461 EDA	AL	LC	087100
1 Kick Plate	8400 10” x 34”	US32D	IV	087100
1 Floor Stop	FS13	US26D	IV	087100

Set: 02

Doors: 110.1

3 Hinge	BB1279	US26D	HA	087100
1 Passage Set	CL3310 NZD	626	RU	087100
1 Surface Closer	1461 EDA	AL	LC	087100
1 Kick Plate	8400 10" x 34"	US32D	IV	087100

Set: 03

Doors: 101.13, 101.14, 101.15, 102.6, 102.7, 102.8

3 Hinge	BB1191 NRP	US32D	HA	087100
1 Storeroom Lock	CL3357 NZD	626	RU	087100
1 Electric Strike	4500C	630	HS	087100
1 SMART Pac Bridge Rectifier	2005M3		HS	087100
1 Overhead Stop	454S	652	GJ	087100
1 Surface Closer	1461	AL	LC	087100
1 Kick Plate	8400 10" x 34"	US32D	IV	087100
1 Threshold	425		NG	087100
1 Gasketing	A626A 1/36" 2/84"		NG	087100
1 Gasketing	706E 36" at head		NG	087100
1 Sweep	D608A		NG	087100

Notes:

Card reader and power supply by access control contractor.

Set: 04

Door: 109.1

3 Hinge	BB1279	US26D	HA	087100	
1 Storeroom Lock	CL3357 NZD	626	RU	087100	
1 Electric Strike	4500C	630	HS	087100	⚡
1 SMART Pac Bridge Rectifier	2005M3		HS	087100	
1 Surface Closer	1461	AL	LC	087100	
1 Kick Plate	8400 10" x 34"	US32D	IV	087100	

Set: 05

Door: 114.1

3 Hinge	BB1279	US26D	HA	087100	
1 Passage Set	CL3310 NZD	626	RU	087100	
1 Surface Closer	1461	AL	LC	087100	
1 Kick Plate	8400 10" x 34"	US32D	IV	087100	
1 Wall Stop	WS406CCV / 407CVX	626	IV	087100	

Set: 06

Door: 105.2

6 Hinge	BB1279	US26D	HA	087100	
2 Flush Bolt	FB53	630	IV	087100	
1 Storeroom Lock	ML2057 NSA	626	RU	087100	
1 Electric Strike	4500C	630	HS	087100	⚡
1 SMART Pac Bridge Rectifier	2005M3		HS	087100	
1 Coordinator	COR72 FL20	628	IV	087100	
2 Mounting Bracket	MB2	689	IV	087100	
2 Surface Closer	1461 EDA	AL	LC	087100	
2 Kick Plate	8400 10" x 34"	US32D	IV	087100	
1 Electric Power Transfer	EL-CEPT		SU	087100	⚡
1 ElectroLynx Harness	QC-C (power transfer to lock or electric strike location)		MK	087100	⚡

Set: 07

Doors: 107.2, 113.1

3 Hinge	BB1279	US26D	HA	087100
1 Privacy Set	CL3320 NZD	626	RU	087100
1 Wall Stop	WS406CCV / 407CVX	626	IV	087100

Set: 08

Doors: 111.1, 112.1

3 Hinge	BB1279	US26D	HA	087100
1 Passage Set	CL3310 NZD	626	RU	087100
1 Wall Stop	WS406CCV / 407CVX	626	IV	087100

Set: 09

Door: 104.2

3 Hinge	BB1279	US26D	HA	087100
1 Storeroom Lock	CL3357 NZD	626	RU	087100
1 Electric Strike	4500C	630	HS	087100
1 SMART Pac Bridge Rectifier	2005M3		HS	087100
1 Surface Closer	1461 EDA	AL	LC	087100
1 Kick Plate	8400 10” x 34”	USD	IV	087100
1 Floor Stop	FS13	US26D	IV	087100

Set: 10

Door: 110.2

3 Hinge	BB1279	US26D	HA	087100	
1 Storeroom Lock	CL3357 NZD	626	RU	087100	
1 Electric Strike	4500C	630	HS	087100	⚡
1 SMART Pac Bridge Rectifier	2005M3		HS	087100	
1 Surface Closer	1461 EDA	AL	LC	087100	
1 Kick Plate	8400 10" x 34"	US32D	IV	087100	

Notes:
Card reader and power supply by access control contractor.

Set: 11

Door: 108.1

3 Hinge	BB1279	US26D	HA	087100
1 Passage Set	CL3310 NZD	626	RU	087100
1 Wall Stop	WS406CCV / 407CVX	626	IV	087100

Set: 12

Not used.

Set: 13

Door: 107.1

3 Hinge	BB1279	US26D	HA	087100
1 Pull Plate	BF 111x70B	US32D	RO	087100
1 Push Plate	70F	US32D	RO	087100
1 Surface Closer	1461	AL	LC	087100
1 Wall Stop	WS406CCV / 407CVX	626	IV	087100

Set: 14

Doors: 101.1, 101.2, 101.3, 101.4, 101.5, 101.6, 101.7, 101.8, 101.9, 101.10, 101.11, 101.12, 102.1, 102.2, 102.3, 102.4, 102.5

1 Overhead Door Hardware	By Others		OT	

Set: 15

Door: 106.1

1 Sliding Door Hardware	PF28200A6084		PE	087100
1 Sliding Door Latch	1069L 626	626	TC	087100

Set: 16

Door: 105.1

6	Hinge	BB1279	US26D	HA	087100
1	Constant Latching Bolt	FB51P	630	IV	087100
1	Passage Set	CL3310 NZD (2-3/4 LATCH, ANSI STRIKE)	626	C-R	087100
2	Kick Plate	8400 10" x 34"	US32D	IV	087100
2	Wall Stop	WS406/407CVX	630	IV	087100

END OF SECTION 087100

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SECTION 08 80 00
GLASS AND GLAZING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Vinyl Windows: Section 08 53 13 “Vinyl Windows”

B. Framed Mirror Units: Section 10 28 13 “Toilet Accessories”

C. Glass for Fire Extinguisher Cabinets: Section 10 44 00 “Fire Protection Specialties”

D. Field-Applied Blinds: Section 12 21 00 “Window Blinds”

1.02 REFERENCES

A. AAMA (American Architectural Manufacturers Association)

1. 800 “Voluntary Specifications and Test Methods for Sealants”
2. 804.3 “Back-Bedding Mastic Glazing Tapes”
3. 1503 “Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections”

B. ANSI (American National Standards Institute)

1. Z97.1 “Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test”

C. ASTM (ASTM International)

1. C1036 “Standard Specification for Flat Glass”
2. C1048 “Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass”
3. C1281 “Standard Specification for Preformed Tape Sealants for Glazing Applications”
4. C1376 “Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass”
5. E773 “Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units”
6. E774 “Specification for Seal Durability of Sealed Insulating Glass Units”
7. E1300 “Standard Practice for Determining Load Resistance of Glass in Buildings”
8. E2190 “Standard Specification for Insulating Glass Unit Performance and Evaluation”

D. CPSC (Consumer Product Safety Commission)

1. 16 CFR 1201 “Safety Standard for Architectural Glazing Materials”

E. GANA (Glass Association of North America)

1. “Glazing Manual”

F. IGCC (Insulating Glass Certification Council)

1. Product Certification Standards

G. IGMA (Insulating Glass Manufacturers Alliance)

1. TM-3000 “North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use”

1.03 DEFINITIONS

A. Safety Glazing: Glazing material which meets the test requirements of ANSI Z97.1 and CPSC 16 CFR 1201.

1.04 SYSTEM DESCRIPTION

A. Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following:
   1. Defective manufacture, fabrication, and installation.
   2. Failure of sealants or gaskets to remain watertight and airtight.
   3. Deterioration of glazing materials.
   4. Other defects in construction.

B. Provide clear, transparent glass (without tint) except where specifically indicated otherwise.

1.05 SUBMITTALS

A. Submit Product Data.
   1. Insulating glass manufacturer’s product technical literature.
   2. Safety glazing manufacturer’s product technical literature.

B. Submit Warranty Documentation.
   1. Insulating glass warranty.
   2. Tempered glass warranty.

1.06 QUALITY ASSURANCE

A. Provide glass and glazing in compliance with the glass manufacturer’s recommendations, and the reference standards listed below, unless more stringent requirements are indicated.
   1. General: GANA, “Glazing Manual.”
   2. Sealed Insulating Glass Unit (IGU) Applications: IGMA TM-3000.

B. Provide safety glazing for glass used in the following applications:
   1. Glazing used in all fixed and operable panels of swinging, bifold, and sliding doors.
   2. Glazing used in all individual fixed or operable panels adjacent to doors where the nearest vertical edge of the glazing is within a 24 inch arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 60 inches above the walking surface.
   3. Glazing used in individual fixed or operable panels where the exposed area of the individual pane is greater than 9 square feet, the bottom edge of the glazing is less than 18 inches above the floor, the top edge of the glazing is greater than 36 inches above the floor, and one or more walking surfaces are within 36 inches measured horizontally and in a straight line, of the glazing.
   4. Glazing used in guards and railings, including structural baluster panels and nonstructural infill panels, regardless of area of height above a walking surface.
   5. Glazing used in walls, enclosures, or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers, and indoor or outdoor

swimming pools, where the bottom exposed edge of the glazing is less than 60 inches measured vertically above any standing or walking surface (applicable to single glazing and all panes in multiple glazing).

6. Glazing used in applications where the bottom exposed edge of the glazing is less than 60 inches above the plane of the adjacent walking surface of stairways, landings between flights of stairs, and ramps.
7. Glazing used adjacent to the landing at the bottom of a stairway where the glazing is less than 36 inches above the landing and within 60 inches horizontally of the bottom tread.

C. Provide insulating glass units permanently marked with certification label of Insulating Glass Certification Council (IGCC).

1. Provide only certified units, tested in accordance with ASTM E2190 (Harmonized Insulating Glass Standard).
2. Maximum Thermal Transmittance (U-factor) for Insulating Glass Units (IGU) with Low-e glazing: 0.31, glass to interior, tested per AAMA 1503.
3. Minimum Condensation Resistance (CRF) for Insulating Glass Units (IGU): 67, glass to interior, tested per AAMA 1503.
4. Minimum Visible Light Transmission: 68 percent.
5. Maximum Solar Heat Gain Coefficient: 0.38.

1.07 WARRANTY

A. Minimum Insulating Glass (Seal Failure) Warranty Period: 10 years.

B. Minimum Tempered Glass Warranty Period: 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide glass products by one of the following approved manufacturers:

1. Cardinal Glass Industries.
2. Pilkington North America.
3. PPG Industries.
4. Guardian Industries Corporation.

2.02 PRIMARY GLASS

A. Clear Annealed Float Glass: ASTM C1036.

1. Type: I (flat, transparent).
2. Quality: Q3 (glazing select).
3. Thickness: As determined in accordance with ASTM E1300, but not less than 1/8 inch, unless indicated otherwise.

2.03 HEAT-TREATED GLASS

A. Tempered Safety Glass: Fully tempered annealed float glass meeting ASTM C1048, ANSI Z97.1, and CPSC 16 CFR 1201.

1. Type: I (flat, transparent).
2. Quality: Q3 (glazing select).
3. Kind: FT (fully tempered).

4. Tint (where indicated): Bronze.
5. Use Category I glazing for applications where the exposed surface area of one side of one light is 9 square feet or less and where the application is not glazing in sliding patio doors or glazing in doors/enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs, or showers.
6. Use Category II glazing for all applications where the exposed surface area of one side of one light is greater than 9 square feet and in all sliding patio doors and glazing in doors/enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs, and showers.
7. Thickness: As determined in accordance with ASTM E1300, but not less than 1/8 inch, unless indicated otherwise.
8. Mark each light of safety glazing with a permanent identifying mark issued by an approved agency which specifies the marking agency, whether manufacturer or installer, and the test standard.

2.04 INSULATING GLAZING

A. Insulating Glass Units (IGU): IGCC Class CBA, preassembled units consisting of sealed lights of annealed float glass (ASTM C1036) separated by a dehydrated interspace and tested in accordance with ASTM E773.

1. Seal Durability: Class A, per ASTM E774.
2. Exterior Lite: 1/4 inch clear float glass (as specified above).
3. Interior Lite: 1/4 inch clear float glass (as specified above).
4. Overall Unit Thickness: 1 inch nominal, unless indicated otherwise.
5. Interspace Content: Argon gas.
6. Spacers: Manufacturer’s standard, non-metallic warm-edge spaces with integral desiccant.
7. Manufacture spacers with roll-formed bends only.
8. Sealant Material: Silicone.
9. Manufacture units with silicone sealant behind the spacer, continuous around the perimeter of the units.
10. High Performance Coating: Low emissivity (as specified below) on third surface.
11. Provide insulating glass units with mullion bars between the glass lites, as indicated in the Drawings.

B. Tempered Insulating Glass Units (Insulating Safety Glass Units): IGCC Class CBA, preassembled units consisting of sealed lights of fully tempered glass (as specified above) separated by a dehydrated interspace and tested in accordance with ASTM E773.

1. Seal Durability: Class A, per ASTM E774.
2. Exterior Lite: 1/4 inch clear fully tempered safety glass (as specified above).
3. Interior Lite: 1/4 inch clear fully tempered safety glass (as specified above).
4. Overall Unit Thickness: 1 inch nominal, unless indicated otherwise.
5. Interspace Content: Argon gas.
6. Spacers: Manufacturer’s standard, non-metallic warm-edge spaces with integral desiccant.
7. Manufacture spacers with roll-formed bends only.
8. Sealant Material: Silicone.
9. Manufacture units with silicone sealant behind the spacer, continuous around the perimeter of the units.

10. High Performance Coating: Low emissivity (as specified below) on third surface.
11. Provide insulating glass units with mullion bars between the glass lites, as indicated in the Drawings.

2.05 GLASS COATINGS

A. High-Performance Coating: Low emissivity clear silver coating reflecting long wave infrared energy, per ASTM C1376.
   1. Provide high performance coating on all glazing used in exterior walls and skylights.
   2. Provide only edge-deleted coated glazing.
   3. Minimum Visible Light Transmittance (T_{vis}): 47 percent.
   4. Maximum Solar Heat Gain Coefficient (SHGC): 0.72.
   5. Maximum Winter U-Factor (argon): 0.29.
   6. Maximum Fading Transmission (Damage-Weighted Transmittance)(T_{dw}): 62 percent.

2.06 GLAZING ACCESSORIES

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated and complying with ASTM C1281 and AAMA 800 for products indicated below:
   1. AAMA 804.3 tape.

C. Expanded Cellular Glazing Tape: Closed-cell polyvinyl chloride (PVC) foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
   1. Type 1, for glazing applications in which tape acts as the primary sealant.
   2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

D. Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal.

E. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

2.07 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for the Project, with edge and face clearances, edge and surface conditions, and bite complying with the written instructions of the product manufacturer and the referenced glazing standard, to comply with system performance requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install glazing in accordance with the glazing manufacturer's instructions and in accordance with the recommendations of the substrate/frame manufacturer and glazing accessory manufacturer.

B. Clean glazing channels and other framing members receiving glass immediately before glazing.

1. Remove coatings not firmly bonded to substrates.

C. Protect glass faces and edges from damage during handling and installation.

1. Do not install glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
2. Heat-treated glazing is particularly susceptible to even minor surface and edge damages and imperfections and must be replaced if chipped, scratched, abraded, or otherwise damaged.

D. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lights.

3.02 CLEANING AND PROTECTION

A. Clean both faces of glass, removing dirt, oils, smudges, markings, and all surface residues.

B. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass.

1. Do not apply markers to glass surfaces.

C. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter, concrete, mortar, grout, incompatible sealants, and chemicals.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged by any cause, including acts of nature, accidents, and vandalism, during the construction period.

END OF SECTION

SECTION 09 22 16
NON-LOAD-BEARING COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Fire-Retardant-Treated Wood Sheathing and Blocking: Section 06 10 00 “Rough Carpentry”

B. Insulation: Section 07 21 00 “Thermal and Acoustic Insulation”

C. Fire-Resistance Rated Cold-Formed Metal-Framed Assemblies: Section 07 80 00 “Fire-Resistant Assemblies”

D. Gypsum Board: Section 09 29 00 “Gypsum Board”

1.02 REFERENCES

A. AISI (American Iron and Steel Institute)

1. S220 “North American Standard for Cold-Formed Steel Framing – Nonstructural Members”

B. ASTM (ASTM International)

1. A123 “Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”
2. A641 “Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire”
3. A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”
4. C645 “Standard Specification for Nonstructural Steel Framing Members”
5. C754 “Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board”
6. E488 “Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements”
7. E497 “Standard Practice for Installing Sound-Isolating Lightweight Partitions”
8. E1190 “Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members”

C. ICC (International Code Council)

1. ES AC86 “Cold-formed Steel Framing Members--Interior Nonload-Bearing Wall Assemblies”

D. USG (USG Corporation)

1. “The Gypsum Construction Handbook”

1.03 SYSTEM DESCRIPTION

A. Standard for Cold-formed Non-Structural Steel Framing: AISI S220.

1.04 SUBMITTALS

A. Submit Product Data.

1. Non-load-bearing, cold-formed metal framing manufacturer’s technical literature and specifications.

1.05 QUALITY ASSURANCE

A. Plans and details for framing are a schematic representation of the framing at various locations and conditions on this Project.
   1. Do not scale or count framing members shown as a substitute for an accurate quantity take-off.
   2. Provide all framing necessary to completely frame the project and provide for all conditions encountered, whether specifically detailed or not.

B. Provide interior non-load-bearing light gage metal framing capable of withstanding a uniform lateral live load of 5 pounds per square foot (in addition to dead and live loads imposed by any attached items), with resulting member deflection due to combined dead and live loading not greater than 1/240th of the span.
   1. Where more stringent, restrictive, or conservative criteria are indicated in these Contract Documents, applicable building codes, referenced standards, or in materials manufacturers' literature, follow the more stringent, restrictive, or conservative requirements.

C. Comply with USG “The Gypsum Construction Handbook,” or other similar industry standard for proper materials and systems selection, detailing, and installation of light gage metal framing for gypsum board assemblies.

D. Provide non-load-bearing framing as required to accommodate deflection of the building structure to which it is attached, while maintaining secure attachment to adjoining structural members.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

A. Steel Framing, General: Comply with ASTM C754 and AISI S220 for conditions and applications indicated.
   1. Protective Coating for Interior Applications: Manufacturer’s standard corrosion-resistant zinc coating conforming to ASTM A653 – G40, or equivalent.
   2. Protective Coating for Exterior, Wet, or Corrosive Applications: ASTM A653 – G60 hot-dip galvanized zinc coating.

B. Non-Load-Bearing Light Gage Metal Studs: ASTM C645, C-shaped studs with knurled faces.
   1. Size and gage as indicated in detail drawings, or if not indicated 0.0329 inch (20 gage) minimum steel thickness prior to application of protective coatings for partitions up to 14 feet in height and 3-5/8 inch minimum depth, and as required by the building code and the framing member manufacturer’s recommendations based on span length, sheathing material and configuration, and specific application.
   2. Provide runners to match studs and as recommended by the stud manufacturer.
   3. Equivalent Gage (“EQ”) framing products having in-place structural properties and corrosion-resistance equivalent to or higher than those specified above, as certified by third-party testing in accordance with ICC ES AC86, and as approved for use in fire resistance rated and acoustic rated assemblies as applicable, are acceptable.

C. Deep-Leg Deflection Track: ASTM C645, top runner with deep flanges.
   1. Also approved are proprietary deflection track products, including tracks with slotted flanges, specifically designed to prevent framing member buckling and cracking of finishes resulting from deflection of the adjacent structure, and similar products designed to maintain the continuity of fire resistance ratings while allowing free deflection of the structure above.

D. Hat Shaped and C-Shaped Furring Channels: ASTM C645.
   1. Minimum Base Metal Thickness: 0.0179 inch (25 gage), unless indicated otherwise.
   2. Depth: As indicated in Drawings.
   3. Fasteners as recommended by the furring member manufacturer.

E. Ceiling Suspension Grid Framing: Hat or C-shaped furring channels (as specified above), spaced 24 inches on-center maximum, supported, in turn, by 1-1/2 inch metal furring channels spaced 4 feet on-center maximum at right angles to the hat or C-shaped furring channels.

2.02 SUPPORT MEMBERS

A. Suspended Ceiling Metal Support Components, General: Steel wire or rods sized to comply with ASTM C754.
   1. Hanger anchorage devices and fasteners as compatible with materials fastened and as proven through construction practice or by certified test data.

B. Tie Wire: ASTM A641, galvanized steel wire.
   1. Class: I.
   2. Temper: Soft.
   3. Minimum Diameter: 0.0625 inch (16 gage) single strand, or 0.0475 inch (18 gage) double strand, unless indicated otherwise.

C. Hanger Wire: ASTM A641, galvanized steel wire.
   1. Class: I.
   2. Temper: Soft.
   3. Minimum Diameter: 0.162 inch (8 gage).

2.03 FASTENERS

A. Fasteners for Suspended Framing Assemblies: Screws, clips, bolts, cast-in-place concrete inserts, or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for the use intended has been proven through standard construction practices or by certified test data.

B. Mechanical Fasteners: Sharp-point self-drilling screws, bolts, nuts, and washers.
   1. Hot-dip galvanized per ASTM A123.
   2. Minimum Self-Drilling Screw Size: Number 6.
   3. Use fasteners with low-profile heads where panel materials will be applied over framing.

C. Powder-Actuated Fasteners: Fabricated from corrosion-resistant materials and suitable for the application indicated as approved by the fastener manufacturer.
   1. Load Capacity: At least 10 times that imposed by construction as determined by testing according to ASTM E1190 by a qualified independent testing agency.

D. Concrete and Masonry Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wire.
   1. Load Capacity: At least 5 times that imposed by construction as determined by testing according to ASTM E488 by a qualified independent testing agency.
   2. Acceptable Types: Cast-in-place anchors, post-installed chemical anchors, or post-installed expansion anchors.

PART 3 EXECUTION

3.01 WALL FRAMING AND FURRING INSTALLATION

A. Metal Framing Installation, General: Comply with ASTM C754 and manufacturer's instructions.
   1. Maximum Resulting Lateral Deflection of Partition Walls: 1/240th of partition height.

B. Align floor and ceiling tracks located per the plan layout.
   1. Secure in place with appropriate structural fasteners at maximum 24 inches on-center, and maximum 2 inches from each end.

C. Frame both sides of expansion and control joints with separate studs.
   1. Do not bridge the joint with components of the stud system.

D. Provide supplementary metal framing, blocking, and bracing for support of all fixtures, equipment, heavy trim, grab bars, gypsum board panel terminations, toilet accessories, furnishings, and similar construction.
   1. Provide framing capable of supporting the minimum required dead and live loads indicated for each attached item.
   2. Use only noncombustible or fire-retardant-treated materials, as permitted by Authorities Having Jurisdiction.
   3. Provide bracing, furring, and bridging as required, fabricated from formed sheet steel in size and thickness as recommended by the stud manufacturer.

E. Place studs at spacing indicated in Wall Types, but not exceeding 24 inches on-center maximum.
   1. Provide double studs at each side of openings and at abutting wall locations.
   2. Install studs full-length and in one piece.
   3. Do not splice studs.

F. Frame door openings to comply with the gypsum board manufacturer's applicable written recommendations.
   1. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   2. Install two studs at each jamb, unless noted otherwise.
   3. For openings greater than 4 feet wide, provide jamb reinforcement using thicker gage studs as recommended by the metal stud manufacturer.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below framed openings to align with adjacent wall stud spacing.

I. Provide deflection allowance in stud track directly below horizontal building framing at non-(vertical)-load bearing framing.

J. Install structural bridging and bracing as shown in the drawings and as recommended by the stud manufacturer for bracing of the wall.

K. For installation of wall assemblies with STC ratings, comply with ASTM E497.

3.02 FRAMING INSTALLATON FOR SOFFITS AND OTHER SUSPENDED FINISHES

A. Suspended Ceilings and Soffits: Space framing and furring members as indicated in detail drawings but not such that the maximum resulting deflection will be greater than 1/360 of their span (distance between supports).
   1. Level ceiling systems to a maximum tolerance of 1/1200.
   2. Suspend ceiling hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structural or ceiling suspension system.
   3. Space hanger wires at 48 inches on center maximum, and closer if required to meet deflection criteria specified above.
   4. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
   5. Attach hangers to structural members.
   6. Wire-tie all intersecting framing members securely together.

B. Laterally brace entire suspension system.

C. Unless specifically indicated to be exposed, provide suspension framing, wires, cables, hardware and fasteners for soffits so that supporting structure and hardware will not be visible from occupied spaces below.

END OF SECTION

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SECTION 09 29 00
GYPSUM BOARD

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Insulation: Section 07 21 00 “Thermal and Acoustic Insulation”

B. Fire-Resistance Rated Gypsum Board Assemblies: Section 07 80 00 “Fire-Resistant Assemblies”

C. Joint Sealants: Section 07 92 00 “Joint Sealants”

D. Cold-Formed, Light Gage, Non-Load-Bearing Steel Framing: Section 09 22 16 “Non-Load-Bearing Cold-Formed Metal Framing”

1.02 REFERENCES

A. ASTM (ASTM International)

1. B69 “Standard Specification for Rolled Zinc”
2. C475 “Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board”
3. C557 “Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing”
4. C840 “Standard Specification for Application and Finishing of Gypsum Board”
5. C954 “Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness”
6. C1002 “Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs”
7. C1047 “Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base”
8. C1396 “Standard Specification for Gypsum Board”
9. D1784 “Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds”
10. D3273 “Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber”
11. D3274 “Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation”
12. D3678 “Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Interior-Profile Extrusions”
13. E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”
14. E90 “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements”
15. E413 “Standard Classification for Rating Sound Insulation”

B. GA (Gypsum Association)

1. 214 “Recommended Levels of Gypsum Board Finish”

2. 216 “Specifications for the Application and Finishing of Gypsum Board”

C. USG (USG Corporation)

1. “The Gypsum Construction Handbook”

1.03 SUBMITTALS

A. Submit Product Data.

1. Panel materials.
2. Trim accessories.
3. Joint treatment materials.

1.04 QUALITY ASSURANCE

A. Comply with USG “The Gypsum Construction Handbook,” or other similar industry standard for proper materials and systems selection, detailing, and installation of gypsum board assemblies.

B. Tolerances: Not more than 1/16 inch difference in true plane at joints between adjacent boards before finishing.

1. Not more than 1/8 inch in 10 feet deviation from true plane, plumb, level, and proper relation to adjacent surfaces in finished work.
2. No visible joints after finishing.

C. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in the assembly indicated according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency.

D. Provide gypsum board products with moisture-resistant surfaces in all locations which might be subject to moisture exposure during and after construction.

1. Use mold- and moisture-resistant joint treatments and accessories in the above locations.

E. Where penetrations or joints are made in or between fire-resistance-rated assemblies, provide tested and approved fire safing sealing assemblies and fire-resistance rated joint systems in accordance with Section 07 80 00.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with the requirements provide products by any of the following manufacturers.

1. National Gypsum Company.
2. Georgia Pacific Corp.
3. United States Gypsum Company.
4. CertainTeed Corporation.

2.02 GYPSUM PANEL MATERIALS FOR INTERIOR APPLICATIONS

A. Standard Gypsum Board: ASTM C1396.

1. Type: Regular.
2. Edges: Tapered, unless indicated otherwise.
3. Thickness: 5/8 inch, unless indicated otherwise.

B. Standard Fire Resistant Gypsum Board: ASTM C1396.
   1. Type: X.
   2. Edges: Tapered, unless indicated otherwise.
   3. Thickness: 5/8 inch, unless indicated otherwise.

C. Enhanced Core Fire Resistant Gypsum Board: ASTM C1396.
   1. Type: C.
   2. Provide panels with a solid set, fire-resistive gypsum core for use in fire-resistive Type C designs.
   3. Edges: Tapered, unless indicated otherwise.
   4. Thickness: 1/2 inch, unless indicated otherwise.

D. Moisture-Resistant Gypsum Board: ASTM C1396.
   1. Type: MR (Moisture Resistant)
   2. Edges: Tapered, unless indicated otherwise.
   3. Thickness: 5/8 inch unless indicated otherwise.

2.03 TRIM ACCESSORIES

A. Where used in fire-resistance rated assemblies, provide trim accessories that comply with the requirements of applicable tested and approved fire rated assemblies.

B. Gypsum Board Corner Trim: ASTM C1047.
   1. Square Corner Bead: Square (90 degree) corner bead made from extruded plastic (PVC), roll-formed zinc, paper-faced metal, or extruded aluminum.

C. Provide corner bead at all outside gypsum board corners.

D. Gypsum Board Edge Trim: ASTM C1047.
   1. Panel Edge Square Trim ("J" and "L") Bead: 7/8 inch wide by thickness-of-gypsum-board extruded plastic (PVC), roll-formed zinc, paper-faced metal, or extruded aluminum profile trim.
   2. Provide pre-manufactured edge trim at all exposed gypsum board panel edges.
   3. Provide edge beads with tear-away legs for applications where gypsum board terminates at a dissimilar finish material.

E. Control Joints: Prefabricated, roll-formed zinc linear control joint with perforated flanges, designed for use between abutting gypsum board panels to relieve stress induced by expansion and contraction in large ceiling and wall expanses and where corners in gypsum board areas introduce an opportunity for cracking.
   1. Provide control joints meeting ASTM C1047, designed to allow for a full 3/8-inch in controlled wall movement.
   2. Provide products with zinc materials meeting ASTM B69.
   3. Sheet Zinc Material Thickness: 0.013 inches.
   4. Opening Shape: V-Shape
   5. Opening Size: 1/4-inch wide by 7/16-inch deep.
   6. Provide products with factory-installed (“tear-away”) plastic tape protecting the opening, which is removed after joint compound or plaster has been applied and the joint has been finished.
   7. Provide all related accessory products as recommended by the joint manufacturer for special conditions, terminations, and intersections.
   8. Approved Product: Clark Dietrich Building Systems, “#093 Zinc Control Joint (ZNCJ).”

9. Approved Product: Marino Ware, “Zinc Control Joint 093.”
10. Approved Product: Phillips Manufacturing Company, “093 Zinc Expansion Control Joint.”

F. Control Joints: Extruded plastic (PVC) with perforated flanges, designed for use between abutting gypsum board panels to relieve stress induced by expansion and contraction in large ceiling and wall expanses and where corners in gypsum board areas introduce an opportunity for cracking.

1. Provide control joints meeting ASTM C1047, designed to allow for a full 3/8-inch in controlled wall movement.
2. PVC Materials: Meeting ASTM D3678 and ASTM D1784.
3. Provide materials achieving Class A rating for flame spread and smoke developed when tested per ASTM E84.
4. Opening Shape: V-Shape
5. Opening Size: 1/4-inch wide by 7/16-inch deep.
6. Provide products with factory-installed (“tear-away”) plastic tape protecting the opening, which is removed after joint compound or plaster has been applied and the joint has been finished.
7. Provide all related accessory products as recommended by the joint manufacturer for special conditions, terminations, and intersections.
8. Approved Product: Clark Dietrich Building Systems, “Vinyl 093 Control Joint (VLCJ).”
9. Approved Product: Trim-Tex Drywall Products, “093V Expansion.”
10. Approved Product: Plastic Components, Inc., “PL093 Control Joint.”

2.04 JOINT TREATMENT MATERIALS

A. Where used in fire-resistance rated assemblies, provide joint treatment materials that comply with the requirements of applicable tested and approved fire rated assemblies.

B. Joint Treatment Compound: Ready-mixed vinyl-based joint compound: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.

1. Where used on glass-mat faced or water-resistant gypsum board products and in other applications where mold- and moisture-resistance is required, use joint compound that is rated 10 when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.

C. Joint Reinforcing Tape: ASTM C475.

1. Nominal Width: 2 inches.
2. Tape Material for Interior Gypsum Wallboard: Paper.

2.05 FASTENERS

A. Fasteners, General: Use fasteners of type and size recommended by the panel manufacturer for the conditions indicated.

B. Gypsum Board Screws: ASTM C1002, steel drill screws with heads, threads, points, and finish as recommended by the gypsum board manufacturer.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inches thick.

C. Gypsum Board Clips: Pre-manufactured, corrosion-resistant (galvanized) metal corner back fasteners designed to support gypsum board panel edges at corners and replace blocking at top plates, end walls, and corners.

1. Minimum Metal Thickness: 20 gage.
2. Approved Product: Prest-On Company, “Cornerback Drywall Fasteners.”

3. Approved Product: Simpson Strong-Tie Company, “DS Drywall Stop.”

2.06 ADHESIVES

A. Gypsum Board Adhesive for Attachment to Metal Framing: ASTM C557.
   1. Maximum VOC content: 50 grams per liter.

B. Contact Adhesive: Multi-purpose contact adhesive complying with FS MMM-A-130, as recommended and approved by the gypsum board and trim materials manufacturers.
   1. Maximum VOC content: 80 grams per liter.

PART 3 EXECUTION

3.01 PREPARATION

A. In cold weather (outdoor temperature less than 55 degrees Fahrenheit), provide controlled heat in the range of 55 degrees Fahrenheit to 70 degrees Fahrenheit.
   1. Maintain heat both day and night, 24 hours per day before, during, and after the entire gypsum board and joint treatment application period and until the permanent heating system is in operation.
   2. Provide ventilation adequate to eliminate excessive moisture.
   3. Under slow drying conditions, allow extra drying time between coats of joint compound.

B. Avoid drafts in spaces where gypsum board finishing is being conducted during hot, dry weather.

3.02 INSTALLATION - GENERAL

A. Install gypsum board in compliance with ASTM C840 and in compliance with the recommendations of GA 216 except where more stringent requirements are given by the panel or accessories manufacturers.
   1. Space screws a maximum of 16 inches on-center (perimeter and field) for vertical (wall) applications unless more stringent requirements are indicated.
   2. Space screws a maximum of 12 inches on-center (perimeter and field) for horizontal (ceiling) applications unless more stringent requirements are indicated.
   3. For fire-resistance-rated assemblies, follow the approved test assembly instructions for fastener types and spacing.

B. Maximum variation of finished gypsum board surfaces from true flatness: 1/8 inch in 10 feet in any direction.

C. Install Gypsum board to minimize butt end joints, especially in highly visible locations.

D. Use gypsum board clips in lieu of additional studs and blocking, where nailers are required for support of gypsum board panel edges.
   1. Space gypsum board clips at maximum 16 inch spacing, using corrosion-resistant fasteners as recommended by the clip manufacturer.

3.03 INSTALLATION FOR FIRE AND SMOKE RATED ASSEMBLIES

A. Where walls are fire resistance rated, provide the complete rated assembly continuous from the top of the floor below to the underside of the roof deck above.
   1. Seal around all penetrations and cut-outs with gypsum, noncombustible sealants, or approved fire safing materials.

2. Seal and fire-safe all perimeters where fire-rated assemblies intersect other construction.
3. Provide accommodation for movement due to deflection of structural framing, while maintaining integrity of fire resistance rating.

3.04 INSTALLATION FOR ACOUSTICAL PERFORMANCE

A. Stagger penetrations occurring on opposite sides of the wall, and where possible, install no more than one penetration in any stud bay.
   1. Thoroughly seal all penetrations with acoustical sealant to prevent sound flanking (sound traveling through the wall at penetrations).

B. STC-Rated Assemblies Installation: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant.
   1. Allow a 1/4 inch gap around all wall perimeter edges, filled with acoustical sealant.
   2. Install acoustical sealant at both faces of partitions at perimeters and through penetrations.
   3. Install acoustical batt insulation in all frame wall cavity spaces.
   4. Provide putty pads or acoustical sealant to seal electrical outlets, junction boxes, and similar penetrations.

3.05 GYPSUM BOARD ACCESSORIES INSTALLATION

A. Install trim accessories in accordance with the manufacturer’s installation instructions.
   1. Install corner bead at all external corners, using longest practical lengths.

B. Provide control joints where wall or ceiling expanses of gypsum board exceed 30 feet in any direction, and where wings of “L-,” “U-,” or “T-“ shaped gypsum board areas are joined.
   1. Follow the installation instructions of the gypsum board panel and joint material manufacturers.
   2. Follow ASTM C840.
   3. Application of control joints requires a break in gypsum board panel surfaces of approximately 1/2-inch – verify per joint manufacturer’s installation instructions.
   4. Separate supports must be provided for each control joint flange.
   5. Where control joints are installed in fire-resistance rated gypsum board assemblies, follow tested and approved UL details, GA 234, and GA 600, as applicable, to maintain fire resistance rating of assembly across joints; adequate seal or safing insulation must be provided behind control joints to maintain rating.
   6. Where vertical and horizontal control joints intersect, vertical control joint must be continuous and horizontal joints abut it.
   7. Apply sealant at all splices, intersections, and terminals.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surfaces, ready to receive finishes.

3.06 FINISHING

A. Finish gypsum board assemblies in accordance with ASTM C840 and GA 216.

B. Apply joint compound in three (3) coats (not including prefill of openings in base), and sand between the last two coats and after the last coat.
   1. In concealed areas receiving gypsum board work, omit the third coat of joint compound and sanding.

2. Finish walls as required to achieve fire rating, thermal rating, sound transmission rating, or other characteristics as indicated.

C. Gypsum Board Finish Level in Plenums, Attics, or Where the Walls or Ceiling are Concealed: Level 1 per GA 214.

D. Gypsum Board Finish Level on all Wall and Ceiling Surfaces Receiving Paint Finishes (except those indicated below to receive Level 5 finish): Level 4 per GA 214.

E. Gypsum Board Finish Level on Curved Surfaces and Vertical and Horizontal Faces of Framed Soffits, Where Semi-gloss or Gloss Paints are Specified, and on Gypsum Board Surfaces in Critical/Severe Lighting Areas (as defined in GA 214): Level 5 per GA 214.

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SECTION 09 51 00
SUSPENDED ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 REFERENCES

A. ASTM (ASTM International)
   1. A641 "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire"
   2. C635 "Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings"
   3. C636, “Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels”
   4. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

B. CISCA (Ceilings and Interior Systems Construction Association)
   1. “Ceiling Systems Installation Handbook”

1.02 SUBMITTALS

A. Submit Product Data.
   1. Acoustical ceiling panel manufacturer’s product data and technical specifications.
   2. Suspension system manufacturer’s product data and technical specifications.
   3. Fire test data and affidavits required by authorities having jurisdiction for exposed materials, assemblies, and finishes demonstrating compliance with code-required maximum allowable flame spread and smoke-developed index ratings.

B. Submit Information.
   1. Fire test data and affidavits required by authorities having jurisdiction for exposed materials, assemblies, and finishes demonstrating compliance with code-required maximum allowable flame spread and smoke-developed index ratings.

C. Submit Warranty Documentation.
   1. Ceiling panel warranty.
   2. Suspension system warranty.

1.03 QUALITY ASSURANCE

A. Provide “Class A” (Flame Spread Index of 25 or less, tested per ASTM E84) rated suspended acoustical panel ceilings.
   1. Provide affidavits substantiating classification if requested by the Architect or Authorities Having Jurisdiction.

B. Maximum Smoke Developed Index: 450 (tested per ASTM E84).
   1. Provide affidavits substantiating classification if requested by the Architect or Authorities Having Jurisdiction.

1.04 WARRANTY

A. Minimum Ceiling Panel Warranty Period: 10 years against sagging or warping when installed in accordance with the manufacturer’s written instructions.

B. Minimum Suspension System Warranty Period: 10 years.

1.05 MAINTENANCE

A. Extra Materials: Upon completion of installation, provide the Owner with one bundle of each type of acoustical ceiling panel installed as extra stock for future use in ceiling repair and maintenance.
   1. Provide bundle with its original wrapping intact, with product manufacturer, style, and color printed clearly on the packaging.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Specification is based on the manufacturers and products indicated in the Interior Finishes Legend and matching of existing finishes.
   1. Do not substitute products without the Owner's and the Architect's approval.

2.02 PANEL MATERIALS

A. Insulating Ceiling Panels – Finish #61: High insulating value, composite fiberglass ceiling panels.
   1. Provide panels that are moisture/humidity-resistant, and that will not sag, warp, chip, crack, or dent.
   2. Thickness: 3 inches.
   3. Panel Size: As indicated in the Drawings
   4. Panel Weight: 0.65 pounds per square foot.
   5. Insulation: Medium-density fiberglass.
   6. Facing: Washable, white textured vinyl.
   7. Minimum R-Value: 13.6
   8. Minimum Noise Reduction Coefficient (NRC): 1.00.
   9. Flammability: Class A, per ASTM E84.
   10. Approved Product: InterSource Specialties Company (ISC), "All in One Fiberglass Ceiling Panels."

2.03 SUSPENSION GRID MATERIALS AND TRIM

A. Standard Suspension Grid: Pre-finished, metal suspension products with die cut and interlocking components per ASTM C635.
   1. Type: Intermediate duty.
   2. Material: Corrosion-resistant steel.
   3. Flange Width: 15/16 inch.
   4. Provide stabilizer bars, clips, splices, moldings, and other trim accessories as required.
   5. Color: White.

B. Edge Moldings, Wall Angles, and Trim: Pre-finished, light gage metal or extruded aluminum of grid manufacturer's standard types and profiles, color and finish matching main grid components.

2.04 CONCEALED SUSPENSION AND ANCHORAGE MATERIALS

A. Provide steel support channels and hangers as required to suit application and ceiling system flatness requirements specified.

B. Hanger Wire: galvanized carbon steel per ASTM A641.
   1. Temper: Soft.
   2. Class: 1, pre-stretched.
   3. Minimum Yield Stress Load: 3 times design load.
   4. Minimum Diameter: 12 gage (0.106 inches).

PART 3 EXECUTION

3.01 PREPARATION

A. Locate and layout system geometry on room axes according to the reflected ceiling plan.
   1. Do not modify ceiling plan layout without prior approval of the Architect.
   2. Coordinate hanger locations with other above-ceiling work.

B. Verify coordination of mechanical, electrical, plumbing, fire protection and architectural elements in the ceiling and in the interstitial spaces above the finish ceiling.

3.02 INSTALLATION

A. Install suspension systems in accordance with ASTM C636, CISCA “Ceiling Systems Installation Handbook,” and the manufacturer’s instructions.
   1. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1/360 of the span.
   2. Space hanger wires on main tees a maximum of 48 inches on-center, attaching hangers directly to structure above.
   3. Hang suspension system independent of walls, columns, ducts, pipes, and conduit.
   4. Avoid visible splices of exposed grid members.
   5. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance without exceeding the maximum deflection specified.
   6. Support fixture loads using supplementary hangers within 6 inches of each corner, or support components independently.
   7. Maximum variation of ceiling from flat and level surface: 1/8 inch in 10 feet.
   8. Maximum variation from plumb of grid members caused by eccentric loads: 2 degrees.

B. Install acoustical panels after above-ceiling work is complete and in accordance with the manufacturer’s instructions.
   1. Where grid spaces are smaller than panel size, cut panels to proper size, matching edge condition of factory-cut units.
   2. Cut panels cleanly around MEP items penetrating the ceiling plane.
   3. Fit panels in place, free from damaged edges or other defects detrimental to the appearance and function of the system.
   4. Install panels level, in uniform plane, and free from twist, warp, and dents.
   5. Fit border trim neatly, snuggly, and squarely against abutting surfaces.

C. Protect acoustical panel ceilings for the duration of the construction period.
   1. Replace damaged or defective components.

END OF SECTION

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SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 REFERENCES

A. ASTM (ASTM International)
   1. E662 "Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials"
   2. F1861 "Standard Specification for Resilient Wall Base"

1.02 SUBMITTALS

A. Submit Product Data.
   1. Resilient base and accessory manufacturers' product technical literature and specifications.

B. Submit Samples.
   1. Resilient wall base.

C. Submit Information.
   1. Fire test data and affidavits required by authorities having jurisdiction for exposed materials, assemblies, and finishes demonstrating compliance with code-required maximum allowable flame spread and smoke-developed index ratings.

D. Submit Warranty Documentation.
   1. Resilient wall base warranty.

1.03 QUALITY ASSURANCE

A. Maximum Smoke Density Index (flaming and nonflaming mode): 450 (at 4 minutes: less than 300), tested per ASTM E662.

1.04 WARRANTY

A. Minimum Resilient Wall Base Warranty Period: 5 years.

1.05 EXTRA MATERIALS

A. At Substantial Completion, deliver extra materials to the Owner.
   1. Resilient Wall Base: Furnish not less than 10 linear feet for every 500 linear feet of fraction thereof, of each different type, size, and color of resilient wall base installed.

B. Furnish extra materials matching the products installed, packaged with protective covering for storage and identified with the manufacturer's original labels clearly describing the contents of each package.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide proprietary products and finishes scheduled, except where finishes exactly matching those indicated can be provided by other approved manufacturers.

B. Subject to compliance with the requirements, provide products by one of the following manufacturers:

1. Azrock, Div. of Domco Tarkett Group, Inc.
2. Johnsonite, Inc.
3. VPI, LLC
4. Flexco, Inc.
5. Armstrong World Industries.
6. Roppe Corporation.

2.02 RESILIENT WALL BASE MATERIALS

A. Rubber Cove Base (RCB): ASTM F1861.

1. Type: TPR (extruded thermoplastic rubber).
2. Group: 1 (solid, homogenous), or 2 (layered).
3. Height: 4 inches.
4. Style: B (Standard top-set cove).
5. Thickness (gage): 1/8 inch.
6. Finish: Smooth, matte.

2.03 ADHESIVES AND ACCESSORIES

A. Accessories and Auxiliary Materials: Provide all required accessories for complete installation of wall base products, including leveling compounds, primers, and sealants.

1. Select adhesives and accessory products as applicable to the conditions of this Project.
2. Provide all adhesives and accessory materials recommended by the wall base manufacturer.
3. Use only those accessory and adhesive materials specifically approved by the wall base manufacturer.

B. Adhesives: Water-resistant, low-or-no-VOC adhesives specifically recommended by the flooring and base manufacturers.

1. Maximum VOC content for rubber cove base adhesives: 50 grams per liter.

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare surfaces to receive finish treatments according to the recommendations of the finish material manufacturers.

1. Prepare substrates for resilient base materials in strict accordance with the written instructions of the material manufacturer.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
4. Grind, sand, or otherwise remove ridges, bumps, and other high spots in substrates.

B. Allow resilient materials to acclimate in conditioned spaces where resilient materials are to be installed as recommended by the material manufacturer.

C. Install wall base and accessory products over clean, dry substrates.

1. Comply with the product manufacturer’s requirements for acceptable ambient, product, and substrate surface temperature ranges for installation.

3.02 INSTALLATION

A. Apply wall base and accessories in strict accordance with the written instructions and recommendations of their respective manufacturers.

B. Scribe, cut, and fit wall base to butt neatly and tightly to adjoining surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and edgings.

C. Do not stretch wall base during installation.

D. Install wall base across built-in cases and fixed equipment.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

3.03 CLEANING AND PROTECTION

A. Protect Work during the curing of adhesives.

1. Insure that environmental conditions during the curing processes are within the acceptable limits established by the finish material manufacturers.
2. Close spaces to traffic during curing period.

B. Clean and protect finished Work.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of the construction period.

D. Return to touch-up and correct or replace unacceptable Work until the Work is acceptable to the Architect and the Owner.

END OF SECTION

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SECTION 09 67 00
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Cast-In-Place Concrete Floors: Section 03 30 00 “Cast-In-Place Concrete”

B. Control Joint Filler in Concrete Slabs: Section 03 30 00 “Cast in Place Concrete”

C. Sealants for Material Finish Transitions: Section 07 92 00 “Joint Sealants”

1.02 REFERENCES

A. ASTM (ASTM International)
1. D412 “Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension”
2. D624 “Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers”
3. D2047 “Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine”
4. E648 "Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source”
5. E662 "Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials"
6. F1869 “Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride”
7. F2170 “Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes”

B. SA (Standards Australia)
1. HB198 “Guide to the Specification and Testing of Slip Resistance of Pedestrian Surfaces”

1.03 SYSTEM DESCRIPTION

A. Fluid-applied resinous flooring with full-chip vinyl broadcast in colors selected by the Owner from the manufacturer’s full range of color/mix options
1. Surface finish shall be the flooring manufacturer’s standard, UV light-resistant resinous grout and sealer.

1.04 SUBMITTALS

A. Submit Product Data.
1. Resinous flooring manufacturer’s, primer, vinyl chip, topcoat, and accessory products technical literature and specifications.

B. Submit Samples.
1. Resinous flooring finishes.

C. Submit Test Results.
1. Prior to installation of resilient flooring materials over concrete slabs-on-grade, submit copies of concrete moisture test results. Include documentation of the

minimum acceptable conditions for installation of flooring materials by the flooring and adhesive manufacturers.

D. Submit Information.
   1. Resinous flooring manufacturer's maintenance instructions.
   2. Fire test data and affidavits required by authorities having jurisdiction for exposed materials, assemblies, and finishes demonstrating compliance with code-required maximum allowable flame spread and smoke-developed index ratings.

E. Submit Warranty Documentation.
   1. Resinous flooring warranty.

1.05 QUALITY ASSURANCE

A. Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source and single manufacturer.
   1. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

B. Installation shall be performed by an applicator with minimum 5-years experience in work of similar nature and scope.
   1. Installer must be approved by the manufacturer of the floor surfacing materials.

C. Installer to verify locations of all flexible joints required by the provisions of this Section and by the recommendations of the related material manufacturers.
   1. Not all joint locations or conditions are necessarily shown or detailed in the Drawings.

D. Critical Radiant Flux (CRF): Class I (at least 0.45 watts per square centimeter), tested per ASTM E648.
   1. Provide affidavits substantiating classification if requested by the Architect or authorities having jurisdiction.

E. Maximum Smoke Density Index (flaming and nonflaming mode): 450 (at 4 minutes: less than 300), tested per ASTM E662.

1.06 SLIP RESISTANCE

A. Slip Resistance: Provide resilient floors having the following minimum static coefficient of friction (SCOF) values as determined by ASTM D2047:
   1. Ramps and Other Sloping Walking Surfaces: 0.8 SCOF
   2. All Other Walking Surfaces: 0.6 SCOF

B. Provide resilient flooring meeting the minimum slip-resistance values of SA HB198, using the Wet Pendulum Test as indicated in Tables 3A and 3B.

1.07 WARRANTY

A. Minimum Resinous Flooring Warranty Period: 1 year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Specification is based on Xtreme Engineered Floor Systems, "V-8 Hybrid XT Full Chip Vinyl System."

1. Alternative manufacturers must meet the standards set forth in this specification and must be preapproved in accordance with project requirements.
2. Obtain the Architect's written approval during the Bidding Phase to substitute proprietary products and finishes scheduled with products with matching finishes by another manufacturer/supplier.

2.02 RESINOUS FLOORING

A. Resinous Flooring: Flooring manufacturer's standard two-part, 100 percent solids flooring system that is self-leveling, ultra-violet (UV) resistant, and chemical resistant.
   1. Resin Part-A: Clear odorless liquid, with chemical name of aliphatic polyisocyanurate.
   2. Resin Part-B: Light yellow colored liquid, mild odor, with chemical name of polyaspartic.
   3. Dry Film Thickness: 40 to 60 mils.
   4. Zero volatile organic compounds (VOC).
   5. Minimum Tensile Strength: 2,920 pounds per square inch (per ASTM D412).
   6. Minimum Tear Strength: 375 pounds per lineal inch (per ASTM D624).
   7. Viscosity: 750 centipoise (CPS) at 75 degrees Fahrenheit.

B. Full-Chip Vinyl Broadcast System.
   1. Primer coat color as selected by the Owner from the manufacturer's full line of colors.
   2. Base coat color as selected by the Owner from the manufacturer's full line of colors.
   3. Vinyl flake colors as selected by the Owner from the manufacturer's full line of colors.
   4. Clear, non-pigmented ground coating over broadcast color chips.
   5. Clear, non-pigmented top/finish coating.

2.03 ACCESSORIES

A. Accessories and Auxiliary Materials: Provide all required accessories for complete installation of flooring and base products, including edge strips, terminations, borders, leveling compounds, primers, and sealants.
   1. Select accessory products as applicable to the conditions of this Project.
   2. Provide all accessory materials recommended by the floor covering manufacturer.
   3. Use only those accessory materials specifically approved by the floor covering manufacturer.

B. Trowelable Leveling and Patching Compound: Trowel-applied, latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by the resilient product manufacturer for the application indicated.
   1. Minimum Compressive Strength: 4,000 pounds per square inch.
   2. Provide primers, aggregates, and other accessory products and materials as recommended by the underlayment concrete manufacturer.
   3. Do not use gypsum-based products.
   4. Use only products which are specifically recommended by the material manufacturer for applications and conditions encountered.
   5. Approved Product: Ardex, Inc., "SD-F Feather Finish"
   6. Approved Product: Ardex, Inc. "SKM Skimcoat Patch and Finishing Underlayment"
   7. Approved Product: Ardex, Inc., "SD-P InstantPatch"

C. Self-Leveling Underlayment Concrete: Liquid-applied (poured or pumped), self-leveling, latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by the resilient product manufacturer for the application indicated.
   1. Minimum Compressive Strength: 4,000 pounds per square inch in not more than 56 days.
   2. Provide primers, aggregates, and other accessory products and materials as recommended by the underlayment concrete manufacturer.
   3. Provide companion epoxy/urethane protection to wearing surface where underlayment material will be exposed to traffic.
   4. Do not use gypsum-based products.
   5. Use only products which are specifically recommended by the material manufacturer for applications and conditions encountered.
   6. Approved Product: Mapei, “Ultratop.”
   7. Approved Product: Ardex, Inc., “K-15”

PART 3 EXECUTION

3.01 PREPARATION

A. Maintain the ambient room and the floor temperatures at 60 degrees Fahrenheit, or above, for a period extending from 72 hours before, during and after floor installation.
   1. Concrete to receive surfacing shall have cured for at least 28 days and shall have been free of water for at least 7 days.
   2. Dew Point: Substrate temperature must be a minimum of 5 degrees above dew point prior to, during, and at least 24 hours after application of flooring system.

B. Illumination: Apply flooring system only where a minimum of 30 footcandles exist when measured 3 feet from surface.

C. Protect adjacent surfaces not scheduled to receive the flooring by masking, or by other means, to maintain these surfaces free of the flooring material.

D. Provide adequate ventilation and fire protection at all mixing and placing operations.
   1. Prohibit smoking or use of spark or flame producing devices within 50 feet of any mixing or placing operation.

E. Provide protective attire, gloves, and other materials, as recommended by the material manufacturer, for all workmen engaged in applying products containing epoxy.

F. Repair damaged or deteriorated concrete according to the resinous flooring manufacturer’s written instructions.

G. Prepare surfaces to receive finish treatments according to the recommendations of the finish material manufacturer(s).
   1. Prepare substrates for fluid-applied flooring and base materials in strict accordance with the written instructions of the applicable material manufacturers.
   2. Remove substrate coatings and other substances that are incompatible with fluid-applied flooring and wall base materials, using mechanical methods recommended by manufacturer.
   3. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

4. Mechanically remove laitance and prepare concrete substrates by shot blasting with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup, as recommended by the finish flooring manufacturer.
5. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
6. Use self-leveling underlayment concrete to correct uneven and out-of-level floor substrates.
7. Provide waterproofing membrane if recommended by the resinous flooring manufacturer due to elevated moisture/humidity levels in substrates.
8. Treat construction joints, control joints, and other non-moving substrate joints to prevent cracks from telegraphing through resinous flooring, in accordance with the resinous flooring manufacturer's written recommendations.
9. Grind, sand, or otherwise remove ridges, bumps, and other high spots in substrates.

H. Notify the Architect in writing prior to commencing Work where in the opinion of the flooring manufacturer and/or installer any substrate conditions are deemed unsatisfactory for the installation
   1. Commencement of installation of flooring materials is construed as material manufacturer's and installer's acceptance of the substrate and environmental conditions as satisfactory for the product installation and uses intended.

I. Treat cracks in concrete using manufacturer's recommended practice.
   1. Rout out crack and fill with rigid epoxy.
   2. Coat repaired cracks with flexible membrane in accordance with finish flooring manufacturer's recommendation to reduce cracking through flooring system.

J. Where resilient flooring materials are to be installed directly over concrete slab-on-grade floors, test the moisture condition and pH of the slab prior to flooring installation.
   1. Perform tests recommended by the flooring material manufacturers.
   2. Document test results and provide a copy to the Architect for information.
   3. Do not proceed with installation until test results are within the acceptable limits as established by the resilient flooring and adhesive manufacturers.
   4. Maximum Acceptable Concrete Slab pH Level: 9, unless more stringent requirements are recommended by the flooring manufacturer.
   5. Maximum Acceptable Concrete Slab Moisture Vapor Emission: 3 pounds per 1,000 square feet per 24 hours, tested in accordance with ASTM F1869, unless more stringent requirements are recommended by the flooring manufacturer.
   6. Maximum Acceptable Concrete Slab Internal Relative Humidity (RH): 75 percent, tested in accordance with ASTM F2170, unless more stringent requirements are recommended by the flooring manufacturer.

K. Where substrate moisture conditions are unacceptable at the time of resilient flooring and base installation, provide a substrate sealer as required to comply with the requirements, recommendations, and warranty conditions of the finish flooring manufacturer.
   1. Apply sealer in multiple coats, in accordance with the sealant manufacturer's instructions, and as required to achieve acceptable substrate moisture vapor emissions.

L. Install flooring, base, and accessory products over clean, dry, and neutral pH substrates.
   1. Comply with the product manufacturer's requirements for acceptable ambient, product, and substrate surface temperature ranges for installation.

2. Commencement of installation of flooring materials is construed as material manufacturer's and installer's acceptance of the substrate and environmental conditions as satisfactory for the product installation and uses intended.

3.02 INSTALLATION

A. Apply leveling and patching compounds, substrate sealers, and other subfloor treatments in strict accordance with the manufacturer's written instructions and recommendations.

B. Apply flooring, base, and accessories in strict accordance with the written instructions and recommendations of their respective manufacturers.

C. Mix components and prepare materials according to the flooring manufacturer's written instructions.

D. Prime entire surface with recommended primer or moisture vapor control treatment.
   1. Apply primer prior to installation of crack isolation membrane and also use to fill cracks.
   2. For properly prepared tile substrates, add filler powder to epoxy primer to create a slurry consistency.
   3. Flat trowel tight against tile to fill grout joints flush and allow to cure.
   4. If grout joints are not completely flush, repeat procedure until joints are filled flush with tile surface.
   5. Subsequent grinding and/or leveling may be necessary to eliminate raised tile edges ("crowning") that may telegraph through the epoxy topping.
   6. For areas that slope to drain, add fume silica to create a paste consistency or use the flooring manufacturer's recommended epoxy paste.

E. Apply UV light resistant resinous grout coat and topcoat(s) to provide a uniform, dense surface.

F. Match finished work to approved samples, uniform in thickness, sheen, color, pattern and texture, and free from defects detrimental to appearance.

3.03 CLEANING AND PROTECTION

A. Protect Work during the curing of adhesives.
   1. Insure that environmental conditions during the curing processes are within the acceptable limits established by the finish material manufacturers.
   2. Close spaces to traffic during curing period.

B. Clean and protect finished Work.
   1. Do not wash surfaces until after the curing time period recommended by the flooring manufacturer.

C. Protect finish flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of the construction period.
   1. Use protection methods recommended in writing by the flooring manufacturer.

D. Return to touch-up and correct or replace unacceptable Work until the Work is acceptable to the Architect and the Owner.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Concrete Curing and Sealing Compounds: Section 03 30 00 “Cast in Place Concrete”

B. Sealants: Section 07 92 00 “Joint Sealants”

1.02 REFERENCES

A. Green Seal
   1. Standard GS-11 “Paints”

B. PDCA (Painting and Decorating Contractors of America)
   1. P1 “Touch-up Painting and Damage Repair – Financial Responsibility”
   2. P4 “Responsibilities for Inspection and Acceptance of Surfaces Prior to Painting and Decorating”
   3. P5 “Benchmark Sample Procedures for Paint and Other Decorative Coating Systems”

1.03 SUBMITTALS

A. Submit Product Data.
   1. Manufacturer’s product literature and technical specifications for all paints and coatings proposed for use.

B. Submit Samples.
   1. Paint finish/color samples.

1.04 QUALITY ASSURANCE

A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required.
   1. Comply with procedures specified in PDCA P5.
   2. Wall Surfaces: Provide samples on at least 100 square feet of wall in situ.
   3. Provide adequate lighting to evaluate benchmark sample areas.
   4. Small Areas and Items: Architect will designate items or areas required.
   5. Final approval of colors will be from benchmark samples.

1.05 PROJECT CONDITIONS

A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees Fahrenheit.
   1. Maintain storage containers in a clean condition, free of foreign materials and residue.

B. Apply paints only when environmental conditions, including temperatures and humidity, of surfaces to be painted and surrounding air are within acceptable acceptable ranges as established by the paint manufacturer.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 degrees Fahrenheit above the dew point.

D. Do not apply paints or coatings to damp or wet surfaces.

1.06 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below.
   1. Package with protective covering for storage and identify with labels describing contents.
   2. Deliver extra materials to the Owner.
   3. Quantity: Not less than 1/2 gallon of each material and color applied.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Material Compatibility: Provide materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

B. Use Low-VOC (volatile organic compound) paint and coating materials where available and approved for the applications indicated.

C. VOC (volatile organic compound) emissions from painting/coating materials shall not exceed the VOC and chemical component limits of Green Seal's Standard GS-11 requirements.
   1. Maximum VOC content for architectural flat paints, coatings, and primers applied to interior surfaces: 50 grams per liter.
   2. Maximum VOC content for architectural non-flat paints, coatings, and primers applied to interior surfaces: 150 grams per liter.

D. Do not use materials containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds.

E. Material Quality: Provide the manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by the manufacturer for application indicated.
   1. Paint-material containers not displaying the manufacturer's product identification will not be acceptable.

F. Colors: As indicated on the Drawings, and as approved by the Owner and Architect.

2.02 PREPARATORY COATS

A. Exterior Primer (Basecoat): Exterior alkyd or latex-based primer of the finish coat manufacturer and recommended in writing by the manufacturer for use with the finish coat and on the substrate indicated.
   1. Wood and Composite Surfaces: Sherwin Williams, Quick Dry Interior/Exterior Stain Blocking Primer, B51W08670.
   2. Zinc-Coated Metal Substrates: Sherwin Williams, Pro Industrial High Performance Acrylic – Semi Gloss, B66-650 Series.
   3. Exterior Metal Substrates: Devoe, Devflex Direct to Metal Primer & Flat Finish, 4020PF.

4. Exterior Metal Substrates: Sherwin Williams, Kem Kromik Universal Metal Primer, B50 Series.
5. Where the manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

B. Interior Primer (Basecoat): Interior latex-based primer recommended in writing by the manufacturer for use with the finish coat and on the substrate indicated.
1. Provide tinted primer where recommended by the manufacturer of the topcoat, as appropriate per the specific topcoat color.
2. Interior Gypsum, Wood, and Filled Masonry Substrates: Benjamin Moore & Co., Pristine Eco Spec Interior Latex Primer Sealer 231.
3. Interior Gypsum, Wood, and Filled Masonry Substrates: Sherwin Williams, Harmony Interior Latex Primer B11W900 Series.
4. Interior Gypsum, Wood, and Filled Masonry Substrates: Pittsburgh Paints, Pure Performance Interior Latex Primer.
5. Interior Gypsum, Wood, and Filled Masonry Substrates: Coronado Paints, Super Kote 5000 Latex Primer-Sealer.
6. Ferrous-Metal Substrates: Sherwin Williams Kem Kromik Universal Metal Primer, B50 Series.
7. Zinc-Coated Metal Substrates: Galvanized metal primer.
8. Where the manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

C. Interior Primer (Basecoat): Interior oil-based stain-blocking primer recommended in writing by the manufacturer for use with the finish coat and on the substrate indicated.
1. Provide tinted primer where recommended by the manufacturer of the topcoat, as appropriate per the specific topcoat color.
2. Interior Oil-Based Stain-Blocking Primer: Sherwin Williams, ProBlock Interior Oil-Based Primer, B79 Series.
3. Where the manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

2.03 EXTERIOR FINISH COATS

A. Exterior Semi-Gloss Acrylic Enamel Paint:
1. Sherwin-Williams; Pro Industrial High-Performance Acrylic, B66-650 Series.

2.04 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint:
1. Sherwin-Williams; ProMar 200 Interior Latex Flat Paint, B30-2600 Series.

B. Interior Low-Luster (Egg-Shell) Acrylic Enamel Paint:
1. Sherwin-Williams; ProMar 200 Interior Latex Eg-Shell Enamel, B20-2600 Series.

C. Interior Semi-Gloss Direct-to-Metal Acrylic Paint:
1. Sherwin-Williams; DTM Acrylic Coating, B66-200 Series.

D. Low-VOC, Low-Luster (Egg-Shell), Waterborne Acrylic Dry Fall Paint:
1. Sherwin-Williams; Waterborne Acrylic Dry Fall, B42 Series.

E. Interior Semi-Gloss Alkyd Enamel Paint:
1. Sherwin-Williams; ProMar 200 Interior Alkyd Semi-Gloss Enamel, B34-2200 Series.

2.05 INDICATIONS

A. Follow the Exterior Elevations, Exterior Finishes Legend, and other indications shown on the Drawings. Where exterior paint and stain types are not indicated, follow the general indications below:
   1. Paint for exterior hollow metal framing and door surfaces: 1 coat exterior primer, minimum 2 coats semi-gloss acrylic enamel paint.
   2. Paint for exterior miscellaneous unprotected steel surfaces: 1 coat exterior primer, minimum 2 coats semi-gloss acrylic enamel paint.

B. Follow the Room Finish Schedule, Interior Elevations, Interior Finishes Legend, and other indications shown on the Drawings. Where interior paint and stain types are not indicated, follow the general indications below:
   1. Paint for new or previously unpainted gypsum board ceiling and soffit surfaces: Minimum of 1 coat latex primer, minimum of 2 coats flat latex paint.
   2. Paint for new or previously unpainted gypsum board wall surfaces: Minimum of 1 coat latex primer, minimum of 2 coats egg-shell latex paint.
   3. Paint for new or previously unpainted hollow metal doors, frames, and miscellaneous exposed metal surfaces: Minimum of 1 coat latex primer, minimum of 2 coats semi-gloss alkyd enamel paint. (Where surfaces are pre-primed, primer coat can be eliminated.)
   4. Paint for new or previously unpainted exposed steel structural members (exposed beams, columns, and associated steel framing): Minimum 1 coat latex primer, minimum of 2 coats waterborne acrylic dry fall paint, or semi-gloss direct-to-metal acrylic paint. (Where surfaces are pre-primed, primer coat can be eliminated.)

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare surfaces to receive finish treatments according to the recommendations of the finish material manufacturers.
   1. Substrate preparation includes (but is not limited to) curing, filling, caulking, sanding, sealing, remedial work, repair, cleaning, drying.
   2. Comply with procedures specified in PDCA P4 for inspection and acceptance of surfaces to be painted.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates.
   1. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

C. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted.
   1. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
   2. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

D. Clean and prepare surfaces to be painted according to the coating manufacturer's written instructions for each particular substrate condition, and as specified.

1. If necessary to achieve painted gypsum board finishes indicated in Section 09 29 00, provide skim coat of gypsum board compound and refinish gypsum board walls prior to applying new paint primers and finish coats.

E. Remove mildew before painting by washing with a solution of 1-part liquid household bleach and 3 parts of warm water.
   1. Apply the solution and scrub the mildewed area.
   2. Allow the solution to remain on the surface for 10 minutes.
   3. Rinse thoroughly with clean water and allow the surface to dry for 48 hours before painting.

F. Gypsum Board Materials Preparation: Set and spackle smooth all fastener heads, taping all joints and covering with joint compound, sanding all areas completely smooth, and removing all dust.
   1. Insure that surfaces to be painted are clean and dry.
   2. Apply gypsum board compound skim coat and refinish if required to achieve acceptable substrates for new painted finishes.

G. Ferrous Metals Preparation: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances.
   1. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
   2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

H. Galvanized Surfaces Preparation: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants.
   1. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

I. Coating Material Preparation:
   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.
   3. Stir as required during application.
   4. Do not stir surface film into material.
   5. If necessary, remove surface film and strain material before using.

3.02 APPLICATION

A. Apply finishes in strict accordance with the written instructions and recommendations of the finish material manufacturer.

B. For painted finishes, provide one primer coat and two finish coats minimum, but not less than the number of coats as required for complete coverage and finished application as defined by the paint material manufacturer.

C. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
   1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

2. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
3. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

D. 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. Omit primer over metal surfaces that have been shop primed and touchup painted.
2. 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.

E. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's written instructions.
1. Take precautions to control overspray of spray-applied paints and coatings.
2. Do not spray-apply paints and coatings where doing so will risk damage to adjacent finishes and equipment from overspray.
3. Do not paint over permanent tags and labels, such as UL labels, identification tags, instructions labels, etc.

F. Minimum Coating Thickness: Apply paint materials no thinner than the manufacturer's recommended spreading rate.
1. Provide total dry film thickness of the entire system as recommended by the manufacturer.
2. Minimum Total Thickness of Primer and Two Topcoats: 4 mils.

G. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in normally occupied spaces.
1. Paint exposed electrical panel board covers to match adjacent finishes.
2. Paint exposed access panels to match adjacent finishes.

H. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others.
1. 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.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage.
1. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Ventilate spaces during finish material application and curing as recommended by the finish material manufacturers.

3.03 CLEANING AND PROTECTION

A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the Project site.

B. Protect the Work of other trades, whether being painted or not, against damage from painting.

C. Protect the Work during curing of finishes. Insure that environmental conditions during curing processes are within the acceptable limits established by the finish material manufacturers.
1. Provide "Wet Paint" signs to protect newly painted finishes.

D. After completing painting operations, remove temporary protective wrappings provided by others to protect their Work.

E. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces.
   1. Comply with procedures specified in PDCA P1.
   2. Correct damage by cleaning, repairing or replacing, and repainting, as approved by the Owner and the Architect.

END OF SECTION

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SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Painted Markings on Pavements: Section 32 17 00 “Paving Specialties”

B. Concrete for Exterior Sign Installation: Section 03 30 00 “Cast-In-Place Concrete”

1.02 REFERENCES

A. ASTM (ASTM International)
   1. B209 “Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate”

B. ICC/ANSI (International Code Council / American National Standards Institute)
   1. A117.1-2003 “Accessible and Useable Buildings and Facilities”

C. UL (Underwriters Laboratories)
   1. 924 "Emergency Lighting and Power Equipment"

1.03 SYSTEM DESCRIPTION

A. Provide interior and exterior directional and identification signage as indicated and as required by the Contract Documents and Authorities Having Jurisdiction.
   1. Provide signage with consistent, coordinated design details and color schemes throughout the building.

1.04 SUBMITTALS

A. Submit Shop Drawings.
   1. Design layout and details for all custom-made signs.

B. Submit Product Data.
   1. Submit product information for all signs being provided from manufacturers’ standard product catalogs.

C. Submit Samples.
   1. Submit manufacturer’s standard color options for Architect’s selection.

1.05 QUALITY ASSURANCE

A. Provide building street numbers attached to the building exterior in a location as required by local Authorities Having Jurisdiction, and as approved by the Owner.

B. Comply with the scoping and technical requirements for signage defined in the Building Code and as required by Authorities Having Jurisdiction.

C. Comply with the technical requirements for barrier-free signage defined in ICC/ANSI A117.1.

D. Provide barrier-free identification by the International Symbol of Accessibility, as defined in ICC/ANSI A117.1, where indicated in the Drawings and in the following locations:
   1. Accessible parking spaces except where the total number of parking spaces provided is five or less.
   2. Accessible entrances where not all entrances are accessible.

3. Unisex toilet and bathing rooms.

E. Provide directional signage, incorporating the International Symbol of Accessibility, as defined in ICC/ANSI A117.1, where indicated in the Drawings and in the following locations:
   1. Inaccessible building entrances.
   2. Inaccessible public toilets and bathing facilities.
   3. Elevators not serving an accessible route.
   4. At each separate-sex toilet and bathing room indicating the location of the nearest unisex toilet or bathing room.

F. Provide signage indicating special accessibility provisions as indicated in the Drawings and as follows:
   1. Each door to an area of refuge, exterior area for assisted rescue, exit stairway, exit ramp, exit passageway, and exit discharge shall have a tactile sign, including raised letters and Braille, stating: EXIT.

G. Mark all exit and exit access doors by an approved exit sign readily visible from any direction of egress travel.
   1. Mark the path of egress travel to exits and within exits by readily visible exit signs clearly indicating the direction of egress travel in cases where the exit or path of egress travel is not immediately visible to the occupants.
   2. Mark all intervening means of egress doors within exits by exit signs.
   3. Place exit signs such that no point in an exit access corridor or exit passageway is more than 100 feet or the listed viewing distance for the sign, whichever is less, from the nearest visible exit sign.
   4. Exit signs are not required in rooms or areas that require only one exit or exit access.

H. Provide Electrically powered, self-luminous and photoluminescent, internally illuminated exit signs listed and labeled in accordance with UL 924 and installed in accordance with the manufacturer's instructions, the Building Code, and Authorities Having Jurisdiction.
   1. Exit signs shall be illuminated at all times, and for a duration of not less than 90 minutes by automatically and immediately transferring to battery backup or an on-site generator in case of primary power loss.
   2. Every *exit* sign and directional *exit* sign shall have plainly legible letters not less than 6 inches high with the principal strokes of the letters not less than 3/4 inch wide.
   3. The word "EXIT" shall have letters having a width not less than 2 inches wide, except the letter "I," and the minimum spacing between letters shall not be less than 3/8 inch .
   4. Signs larger than the minimum established herein shall have letter widths, strokes and spacing in proportion to their height.
   5. The word "EXIT" shall be in high contrast with the background and shall be clearly discernible when the means of *exit* sign illumination is or is not energized.
   6. If a chevron directional indicator is provided as part of the *exit* sign, the construction shall be such that the direction of the chevron directional indicator cannot be readily changed.

I. Provide building street address numbers, in Arabic numerals, mounted on the face of the building in a location and position that is plainly legible and visible from the street or road fronting the property, as required by Authorities Having Jurisdiction.

1. Where access is by means of a private road or driveway, and the building cannot be viewed from the public way, provide a monument- or pole-mounted sign to identify the structure.
2. Provide street address numbers in sizes, fonts, and materials, as acceptable to Authorities Having Jurisdiction and the Owner, but not less than 4 inches high with a minimum stroke width of 1/2 inch.
3. Provide street address numbers in corrosion-resistant metal or plastic, in a color contrasting with their background, as acceptable to Authorities Having Jurisdiction and the Owner.
4. Install street numbers in a location on the exterior of the building, and at a mounting height, as acceptable to Authorities Having Jurisdiction and the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with the requirements, provide products by one of the following manufacturers:
   1. Allenite Signs; Allen Marking Products, Inc.
   2. American Graphics Inc.
   3. Andco Industries Corp.
   4. APCO Graphics, Inc.
   5. ASI Sign Systems, Inc.
   6. Best Manufacturing Co.
   7. Grimco, Inc.
   8. Innerface Sign Systems, Inc.
   9. Kaltech Industries Group, Inc.
   10. Mills Manufacturing, Inc.
   11. Mohawk Sign Systems.
   12. Quartet Manufacturing Company.[toilet room sign used at Lot 21]
   13. Seton Identification Products.
   14. Signature Signs, Inc.
   15. Supersine Company (The).

2.02 MATERIALS

A. Plastic Sheet and Extrusions: Manufacturer’s standard cast, molded, or extruded acrylic, polystyrene, or PVC.
   1. Color: As selected by the Architect from the manufacturer’s full range.

B. Aluminum Sheet and Plate: ASTM B209.
   1. Alloy and Temper: As recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 5005-H15.

C. Mounting and Attachment Materials: Provide adhesives, tapes, brackets, and mechanical fasteners for secure attachment of signage to applicable substrates.
   1. Use mounting and attachment materials approved by the Architect and sign manufacturer.
   2. Use concealed fastening where possible.

3. Where exposed fasteners are required, provide fasteners pre-finished to match the color of the adjacent sign material.

2.03 FABRICATION

A. Graphic Content and Style: Provide sign copy that complies with requirements indicated on Drawings for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
   1. Where graphic content and style are not indicated on Drawings, obtain Architect's approval of sign design as proposed by sign manufacture.

B. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1.
   1. Accompany text with Grade 2 Braille.
   2. Produce precisely formed characters with square cut edges free from burrs and cut marks.
   3. Panel Material: Opaque plastic sheet with opaque color coating.
   4. Raised-Copy Thickness: Not less than 1/32 inch.

C. Unframed Panel Signs for Exterior Applications: Aluminum sheet or plate.
   1. Corner Condition: Radiused
   2. Copy: Applied die-cut vinyl film or baked enamel paint suitable for exterior exposure.
   3. Minimum Character Dimensions: Comply with ICC/ANSI A117.1.

D. Unframed Panel Signs for Interior Applications: Plastic sheet.
   1. Edge Condition: Square cut with beveled top edges.
   2. Copy: Applied or engraved plastic, as applicable.
   3. Minimum Character Dimensions: Comply with ICC/ANSI A117.1.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide blocking for signs where required by sign weight or for secure attachment.

B. Field-verify acceptability of substrates for signage.

C. Verify dimensions of substrates are suitable for sign sizes required.

D. Where substrates are not acceptable, obtain approval from the Architect to modify or relocate signs prior to procurement of signage materials.

3.02 INSTALLATION

A. Locate signs and accessories where indicated and where required, using mounting methods suitable for application and approved by the Architect and sign manufacturer.
   1. Comply with the barrier-free sign location requirements of ICC/ANSI A117.1, where applicable.
   2. Install interior wall signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls.
   3. Locate barrier-free signage to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

C. Wall-Mounted Panel Sign Mounting Methods: Attach panel signs to wall surfaces using the methods indicated below, as applicable.

1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
2. Hook-and-Loop Tapes: Use hook-and-loop tapes to mount signs to smooth, nonporous surfaces.
3. Magnetic Tape: Use magnetic tape to mount signs to smooth, nonporous surfaces.
4. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
5. Shim Plate Mounting (for mounting to irregular surfaces): Provide 1/8 inch thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable; attach plate with fasteners and anchors suitable for secure attachment to substrate; attach panel signs to plate using method specified above.
6. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes; attach signs with fasteners and anchors suitable for secure attachment to the substrate as recommended in writing by the sign manufacturer.

D. Post-Mounted Panel Sign Mounting Methods: Attach panel signs to posts with non-corrosive screws as applicable to the sign and post materials and as recommended by the sign manufacturer.

E. Building Wall-Mounted Panel Sign Mounting Methods: Attach panel signs to exterior walls with non-corrosive screws as applicable to the sign and wall materials and as recommended by the sign manufacturer.

3.03 CLEANING AND PROTECTION

A. Clean installed signage of dirt, smudges, and markings of any kind.

B. Protect signage from damage or theft for the duration of the construction period.

END OF SECTION

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SECTION 10 21 13
TOILET COMPARTMENTS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Fiber Reinforced Plastic (FRP) Panels: Section 06 40 00 “Finish Carpentry and Architectural Woodwork”

B. Toilet Accessories: Section 10 28 13 “Toilet Accessories”

1.02 REFERENCES

A. ASTM (ASTM International)

1. A591 “Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Weight [Mass] Applications”
2. A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”

1.03 SYSTEM DESCRIPTION

A. Provide floor-mounted, overhead braced, prefinished metal facedtoilet partitions and wall-mounted urinal screens complete with doors, pilasters, anchorages, reinforcements, hardware, and accessories required for a complete installation.

1. Partition configurations shown in Drawings.
2. Provide unit sizes and dimensions in compliance with building code and barrier-free accessibility requirements.

1.04 SUBMITTALS

A. Submit Shop Drawings.

1. Toilet compartment and urinal screen shop drawings including plans, elevations, sections, details, and attachments to other work.

B. Submit Samples.

1. Exposed finishes proposed for toilet compartments and urinal screens.

C. Submit Warranty Documentation.

1. Toilet compartments.
2. Urinal Screens.

1.05 QUALITY ASSURANCE

A. Provide all toilet partitions and screens by the same manufacturer.

1.06 WARRANTY

A. Powder-Coated Steel Toilet Compartments and Urinal Screens Minimum Warranty Period: 3 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with the requirements, provide floor-mounted, overhead braced, metal toilet partition products and wall-mounted, powder-coated steel urinal screen products by one of the following manufacturers:
   1. Bradley Corporation; Mills Partitions.
   2. Hadrian Manufacturing, Inc.
   3. Knickerbocker Partitions Corporation.

2.02 METAL UNITS

A. Panel Cores: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness indicated.

B. Facing Sheets and Closures: ASTM A591 (electrolytically zinc-coated) or ASTM A653 (hot-dip galvanized or galvannealed), commercial steel sheet for exposed applications, that is mill phosphatized, and selected for smoothness.
   1. Minimum Thickness for Doors and Panels: 0.030 inches.
   2. Minimum Thickness for Pilasters: 0.036 inches.

C. Headrails: Manufacturer’s standard extruded, anodized aluminum.
   1. Minimum Section Dimensions: 1 inch by 1.625 inches.
   2. Minimum Extrusion Wall Thickness: 0.060 inches.

D. Metal Finishes: High-performance powder-coating, baked on to provide a smooth, uniform, protective finish.
   1. Thoroughly clean and phosphate metal prior to finishing.
   2. Color: As selected from the manufacturer’s standard finishes.

E. Door, Panel, Screen, and Pilaster Construction: Pressure-laminate seamless, metal facing sheets to core material.
   1. Provide units with continuous, interlocking molding strip or lapped and formed edge closures.
   2. Provide units with exposed surfaces free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.
   3. Seal all corners by welding or clips; grind exposed welds smooth.
   4. Door, Panel, and Screen Finish Thickness: Not less than 1 inch.
   5. Pilaster Finish Thickness: Not less than 1-1/4 inch.
   6. Provide concealed internal reinforcement for grab bars, hardware, and other fixtures mounted on units.
   7. Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

F. Hardware and Fittings: Chrome-plated, zinc die castings.
   1. Use hardware provided by the panel manufacturer, and approved by the manufacturer for the uses and conditions indicated.

G. Sheet Metal Finish: Thoroughly cleaned, phosphate, and finished with a high-performance powder coating, electrostatically-applied and oven-cured to provide a uniform, smooth, protective finish.
   1. Color as indicated in the Drawings.

2.03 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty hardware and accessories.
   1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac) or stainless steel.
   2. Provide combined coat hook and bumper on inside face of inswinging compartment doors.
   3. Provide theft-proof fasteners where exposed.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass.
   1. Finish: Match hardware.
   2. Provide theft-resistant-type heads at exposed fasteners.
   3. Provide sex-type bolts for through-bolt applications.
   4. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.04 FABRICATION

A. Floor-Anchored, Overhead-Braced Units: 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.
   1. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Doors: Unless otherwise indicated, provide 24-inch wide in-swinging doors for standard toilet compartments and 34-inch wide out-swinging doors with a minimum 32-inch wide clear opening for barrier-free compartments.
   1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
   2. Latch and Keeper: Manufacturer's standard surface-mounted 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 barrier-free compartments.
   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 bumper at out-swinging doors.
   5. Door Pull: Manufacturer's standard units that comply with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at barrier-free compartments.

C. Urinal Screens: Provide urinal screens of dimensions indicated on the Drawings, and in compliance with the following:
   1. Minimum Horizontal Distance from Wall to Outer Edge of Screen: 18 inches.
   2. Maximum Vertical Distance from Floor to Bottom of Screen: 12 inches.
   3. Minimum Vertical Distance from Floor to Top of Screen: 60 inches.
   4. Provide the screen manufacturer’s standard, corrosion-resistant mounting hardware for secure attachment to wall substrates and blocking, in compliance with the manufacturer’s installation instructions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with the manufacturer's written installation instructions.

B. Install units rigid, straight, level, and plumb.

C. Secure units in position with the manufacturer's recommended anchoring devices.

1. Maximum Clearances Between Pilasters and Panels: 1/2 inch.
2. Maximum Clearances Between Panels and Walls: 1 inch.

3.02 CLEANING AND PROTECTION

A. Clean and protect installed toilet compartments and urinal screens for the duration of the construction period.

1. Replace defective or damaged units.

END OF SECTION

SECTION 10 26 00
WALL AND CORNER GUARDS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Fiber-Reinforced Plastic (FRP) Sheet Wall Protection: Section 06 40 00 “Finish Carpentry and Architectural Woodwork”

1.02 REFERENCES

A. ASTM (ASTM International)
   1. A666 “Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar”
   2. E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”

1.03 SYSTEM DESCRIPTION

A. Provide wall and corner protection in locations as indicated in the Drawings.

1.04 QUALITY ASSURANCE

A. Provide wall and corner guard units with surface-burning characteristics as determined by testing identical products per ASTM E84 or another testing and inspecting agency acceptable to Authorities Having Jurisdiction.
   1. Maximum Flame Spread Index: 25, per ASTM E84 (Class I/A).
   2. Maximum Smoke Developed Index: 450, per ASTM E84 (Class I/A).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture, and physical properties.

2.02 MATERIALS

A. Stainless Steel Sheet: ASTM A666.
   1. Type: 304.

2.03 CORNER GUARDS

A. Stainless Steel Corner Guards: One-piece stainless steel bent-sheet corner guards.
   1. Dimensions: 1-1/2 inch by 1-1/2 inch, by 48 inches high.
   2. Steel Thickness: 16 gage.
   3. Steel Finish: No. 4 (satin).
   4. Angle: 90 degree, with 1/4-inch radius at corner.

5. Provide units in continuous lengths (without splices) from the top of the wall base to a line 48 inches above the wall base.
6. Attachment: Full coverage specialty adhesive, as supplied or recommended by the corner guard manufacturer.
7. Approved Product: Inpro Corporation (IPC), Model #181124C-304.

2.04 FABRICATION

A. Fabricate wall and corner guard units to comply with the requirements indicated for design, dimensions, detail, finish, and member sizes.

2.05 FINISHES

A. Provide wall and corner guard units in finishes as selected by the Architect from the manufacturer's full line of colors and finishes.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide noncombustible blocking in walls to receive wall and corner guard units as required for secure attachment in accordance with the wall and corner guard manufacturer's recommendations.

B. Complete finishing operations, including painting, before installing wall and corner guard system components.

C. Prior to installation, clean substrates to remove dirt, debris, and loose particles.

D. Comply with the manufacturer's requirements for environmental conditions at the time of installation and after installation.
   1. Wall surfaces shall be dry and free from dirt, grease, and loose paint or other particles.

3.02 INSTALLATION

A. Install wall and corner guard units level, plumb, and true to line without distortions.
   1. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

B. Install corner guards in continuous pieces, for the full height of the installation.
   1. Do not splice pieces, or install corner guards with joints.

C. Verify consistency of color and finish of installed wall and corner protection units.
   1. Remove and replace units which are damaged or which exhibit inconsistent or incorrect color or finish sheen.

3.03 CLEANING AND PROTECTION

A. Keep wall and corner guards clean for the duration of the construction period.

B. Replace defective units and units damaged during the construction period.

END OF SECTION

SECTION 10 28 13
TOILET ACCESSORIES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Urinal Screens: Section 10 21 13 “Toilet Compartments”

1.02 REFERENCES

A. ASTM (ASTM International)
1. A153 “Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”
2. A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”
3. A666 “Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar”
4. A1008 “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability”
5. B16 “Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines”
6. B19 “Standard Specification for Cartridge Brass Sheet, Strip, Plate, Bar, and Disks (Blanks)”
7. B30 “Standard Specification for Copper Alloys in Ingot Form”
8. B456 “Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium”
9. C1036 “Standard Specification for Flat Glass”
10. C1503 “”Standard Specification for Silvered Flat Glass Mirror”
11. F446 “Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area”

1.03 SYSTEM DESCRIPTION

A. Provide toilet and bath accessories complete with all anchorages, reinforcements, hardware, and accessories required for a complete installation.
1. Provide units complying with barrier-free accessibility requirements.
2. Mount units in compliance with barrier-free accessibility requirements.
3. Install grab bars to withstand a downward load of at least 250 pound-feet, when tested in accordance with ASTM F446.

1.04 SUBMITTALS

A. Submit Product Data.
1. Submit product data for each product indicated.

B. Submit Warranty Documentation.
1. Warranty documentation for each product indicated.

1.05 WARRANTY

A. Minimum Mirror Warranty Period: 15 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Specification is based on proprietary products scheduled.
   1. Approved substitutions meeting the requirements are acceptable.

B. Approved Toilet and Bath Accessory Manufacturers:
   1. A & J Washroom Accessories, Inc.
   2. American Specialties, Inc.
   3. Bobrick Washroom Equipment, Inc.
   4. Bradley Corporation.
   5. General Accessory Manufacturing Co. (GAMCO).
   6. McKinney/Parker Washroom Accessories Corp.

C. Approved Under-Lavatory Guard Products Manufacturers:
   1. Brocar Products, Inc.
   2. IPS Corporation (Truebro, Inc. “Lav-Guard2® Under-Sink Protective Pipe Covers”)

2.02 MATERIALS

A. Stainless Steel: ASTM A666.
   1. Type: 304.
   2. Minimum Nominal Thickness: 0.050 inches (18 gage), unless indicated otherwise.

B. Brass: ASTM B19, ASTM B16, or ASTM B30 castings.

C. Steel Sheet: ASTM A1008, Commercial Steel (CS).
   1. Minimum Nominal Thickness: 0.0359 inches.

D. Galvanized Steel Sheet: ASTM A653.
   1. Minimum Coating: G60.

E. Chromium Plating: ASTM B456.
   1. Service Condition: Number SC 2 (moderate service).

F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

G. Mirror Glass: ASTM C1036.
   1. Type: I.
   2. Class: 1.
   3. Quality: q2.
   4. Minimum Nominal Thickness: 6.0 millimeters.
   5. Silvering, electroplated copper coating, and protective organic coating complying with ASTM C1503.

2.03 UNITS

A. Toilet Paper Dispensers: Fixture Designation 02 (as indicated in Drawings).
   1. Type: Double-roll dispenser.
   2. Operation: Noncontrol delivery with manufacturer's standard spindles, accommodating two toilet tissue rolls.
   3. Capacity: Designed for up to 6 inch diameter tissue rolls, with theft-resistant spindles.
   4. Material: Heavy-duty cast aluminum.
   5. Finish: No. 4 finish (satin).
   6. Mounting: Surface-mounted with concealed anchorage.

B. Grab Bars: Fixture Designations 03, 04 and 05 (as indicated in Drawings).
   1. Bar Type: 1-1/2 inch (outside) diameter tubing fabricated to comply with configurations required for barrier-free compliance.
   2. Tubing Material: Stainless steel.
   3. Tubing Thickness: 0.050 inches (18 gage).
   4. Finish: No. 4 (satin).
   5. Mounting: Surface-mounted with concealed anchorage.
   6. Provide flanges and attachment materials of material finishes matching grab bars (where exposed).

C. Framed Mirrors: Fixture Designation 06 (as indicated in Drawings).
   1. Mirror Standard: ASTM C1503.
   2. Glass mirrors in manufacturer's standard frames.
   3. Mirror Glass: ASTM C1036, as further defined above.
   4. Frame Material: Stainless steel channel.
   5. Frame Finish: No. 4 finish (satin).
   6. Tilt: None.
   7. Size(s): As indicated in Drawings.
   8. Mounting: Surface-mounted with concealed anchorage.

D. Under-Lavatory Guards: Fixture Designation 07 (as indicated in Drawings).
   1. White, molded rigid vinyl, antimicrobial insulating piping coverings for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping.
   2. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

E. Clothes Hooks: Fixture Designation 11 (as indicated in Drawings).
   1. Stainless steel, double-prong robe hook with rectangular wall bracket and backplate for concealed mounting.
   2. Stainless steel, single prong robe hook with rectangular wall bracket and backplate for concealed mounting.

F. Towel Bars: Fixture Designation 14 (as indicated in Drawings).
   1. Bar Type: 1 inch outside diameter round stainless steel tubing with rectangular end brackets and galvanized steel backplates for concealed mounting.
   2. Material: Stainless steel.
   3. Finish: Satin.
   4. Bar Length: See Drawings.

5. Mounting: Surface-mounted with concealed anchorage and snap flange.

G. Surface-Mounted, Roll Paper Towel Dispensers: Fixture Designation 15 (as indicated in Drawings).
1. Towel Type: Standard paper towel rolls up to 6-inches in diameter.
2. Bracket Material: Heavy-duty cast aluminum with satin finish.
3. Spindle Material: Molded and extruded ABS.
4. Provide units equipped with retractable pin and concealed locking spindle mechanism, with controlled delivery operation.
5. Mounting: Surface.

H. Stainless Steel Shelves: Fixture Designation 17 (as indicated in Drawings).
1. Stainless steel, wall-surface-mounted shelf made of 18-8, type-304, 18-gage stainless steel with 3/4-inch return edges for rigidity and hemmed front edge for safe handling.
2. Shelf Dimensions: 24-inches long by 5-inches deep.
3. Mounting Brackets: 18-8, type-304, 16-gage stainless steel, welded to back return of shelf and secured inside front hem of shelf.
4. Attachment: Non-corrosive metal screws as recommended by the shelf manufacturer.
5. Finish: Satin stainless steel.

I. Folding Shower/Dressing Area Seats: Fixture Designation 18 (as indicated in Drawings):
1. Folding seat with frame constructed of type-304, satin-finish stainless steel that consists of 16-gage square tubing and 18 gage, 1-inch diameter seamless tubing, and seat constructed of one-piece, 5/16-inch thick solidly fused plastic laminate with matte-finish melamine surfaces, secured to frame.
2. Seat to comply with applicable barrier-free accessibility requirements.
3. Seat shall be able to lock in upright position when not in use.
4. Seat surface-mounted to wall as recommended by the seat manufacturer.
5. Seat Finishes: Ivory-colored face sheets and black phenolic-resin core.
6. Approved Product: Bobrick Washroom Equipment, Inc., Solid Phenolic Folding Shower/Dressing Area Seat, Model #B-5191.

2.04 FASTENERS AND ANCHORAGES

A. Galvanized Steel Mounting Devices: ASTM A153, hot-dip galvanized after fabrication.

B. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.05 ACCESSORIES

A. Keys: Provide universal keys for internal access to accessories for servicing and re-supplying.
1. Provide minimum of six keys to the Owner.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install toilet and bath accessories in accordance with the manufacturer’s written instructions.

B. Install toilet and bath accessories in locations and at heights in compliance with applicable barrier free requirements.

C. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer.
   1. Install units level, plumb, and firmly anchored in locations and at heights indicated.

D. Mount toilet and bath accessory units to solid structural members or blocking in adjacent walls.
   1. Use only noncombustible or approved fire-retardant-treated (FRT) wood blocking.
   2. Mounting Type: Concealed mounting with snap flanges or other trim provided by the accessory manufacturer, except where mounting with exposed fasteners is specifically indicated.
   3. Mount toilet and bath accessory units to withstand a force of not less than 250 pounds in any direction without rotation, deformation, or failure of attachment.

E. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly.
   1. Replace damaged or defective items.
   2. Remove temporary labels and protective coatings.

END OF SECTION

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SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Fire-Rated Construction: Section 07 80 00 “Fire-Resistant Assemblies”

1.02 REFERENCES

A. ASTM (ASTM International)
   1. A1008 “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability”
   2. C1048 “Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass”

B. NFPA (National Fire Protection Association)
   1. 10 “Portable Fire Extinguishers”

C. UL (Underwriters Laboratories”
   1. 711 “Rating and Fire Testing of Fire Extinguishers”

1.03 SUBMITTALS

A. Submit Product Data.
   1. Fire extinguishers, including maintenance instructions and product rating and classification in accordance with applicable building and fire prevention code standards.
   2. Fire extinguisher cabinets, Including door hardware, cabinet type, trim style, panel style, finishes, and details of installation.
   3. Firefighter’s key access boxes.

B. Submit Finish Samples.
   1. Fire extinguisher cabinet exposed finishes.
   2. Firefighter’s key access box exposed finishes.

C. Submit Warranty Documentation.
   1. Fire extinguishers.

1.04 QUALITY ASSURANCE

A. Provide fire extinguisher cabinets that comply with applicable barrier-free accessibility requirements.
   1. Maximum cabinet projection for corridors: 4 inches.

B. Fabricate and label fire extinguishers to comply with NFPA 10.

C. Provide fire extinguishers listed and labeled for type, rating, and classification by an independent testing agency acceptable to Authorities Having Jurisdiction.

D. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

E. Where fire extinguisher cabinets are recessed (or semi-recessed) in fire-rated wall assemblies, provide cabinets meeting the requirements for the fire ratings of the walls.

1.05 WARRANTY

A. Fire Extinguisher Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Minimum warranty period: 6 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved Fire Extinguisher Cabinet Manufacturers:
   1. JL Industries, Inc.
   2. Larsen’s Manufacturing Company
   3. Potter Roemer Fire Protection Equipment

B. Approved Fire Extinguisher Manufacturers:
   1. Ansul Incorporated
   2. JL Industries, Inc.
   3. Kidde Fyrnetics
   4. Larsen’s Manufacturing Company
   5. Potter Roemer Fire Protection Equipment

C. Approved Fire Fighter’s Key Access Box Product:
   1. Knox Company, “Knox-Box 3200 Series.”
   2. No substitutions will be allowed unless specifically required by the local Fire Department.
   3. Confirm acceptability of product specified with local Fire Department officials.

2.02 FIRE EXTINGUISHER CABINETS

A. Cabinet Type: Suitable for fire extinguisher required.
   1. Mounting Type: Recessed.
   2. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire-protection cabinets.

B. Cabinet Construction: Non-rated, except where recessed (or semi-recessed) in fire-rated wall assemblies.
   1. For units installed in fire-rated wall assemblies, provide cabinets meeting the minimum fire-resistance rating requirements of the applicable walls.

C. Cabinet, door, and trim Material: Commercial sheet steel (CS) per ASTM A1008.
   1. Type: B.

D. Cabinet Door Style: Fully glazed panel in steel frame.

E. Glazing: Clear, tempered float glass, ASTM C1048.
   1. Kind: FT.
   2. Condition: A.
   3. Type: I.
   4. Quality: q3.
   5. Thickness: 3 mm.
   6. Class: 1 (clear).

F. Hardware: Manufacturer’s standard.

G. Finishes: Manufacturer’s standard baked enamel paint for all exposed steel surfaces.
   1. Color: White.

2.03 PORTABLE FIRE EXTINGUISHERS

A. Portable Fire Extinguisher Standard: NFPA 10.
   1. Fire Hazard Class: A.
   2. Minimum Rating per Extinguisher: 3-A, per UL 711.

B. Where fire extinguisher cabinets are not specified, provide appropriate mounting brackets and hardware for surface wall-mount application.

2.04 FIREFIGHTER’S KEY ACCESS BOXES

A. Provide firefighter’s key access box as required by the local Fire Department having jurisdiction.
   1. Verify applicability and quantities required for this Project.
   2. Verify product specification with the Fire Department.
   3. Provide recessed mounting kit for applications where boxes can be recessed in new exterior wall construction.

PART 3 EXECUTION

3.01 PREPARATION

A. Provide noncombustible blocking in frame walls suitable for mounting of fire extinguisher cabinets.

B. Examine walls and partitions for suitable framing depth and blocking where recessed (or semi-recessed) cabinets will be installed.
   1. Prepare recesses for recessed (or semi-recessed) fire-protection cabinets as required by type and size of cabinet and trim style.

C. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged units.

D. Make application for firefighter’s key access box with local Fire Department having jurisdiction.
   1. Submit information to the Fire Department on proposed products for Fire Department approval.
   2. Modify proposed system at the request of the Fire Department.
   3. Verify location of access box installation with the Fire Department.

3.02 INSTALLATION

A. Locate portable fire extinguishers and cabinets in locations indicated, or if not indicated, in conspicuous locations, along normal paths of travel, where they will be readily accessible and immediately available for use, as directed by Authorities Having Jurisdiction.
   1. Do not exceed maximum 75 feet travel distance from any point to the nearest portable fire extinguisher, as prescribed by Building Code and Fire Department Authorities Having Jurisdiction.
   2. Install fire-protection specialties at mounting heights indicated or, if not indicated, at heights acceptable to Authorities Having Jurisdiction.

B. Fasten fire-protection cabinets to structure, square and plumb.
   1. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Adjust fire-protection cabinet doors and hardware to operate easily without binding.

D. Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

E. Install firefighter's key access boxes in accordance with the manufacturer's instructions and the requirements of the local Fire Department.
   1. Where installation locations are not shown in the Drawings, locate key access boxes in a conspicuous location near the building main entrance, as approved by the local Fire Department.

3.03 CLEANING AND PROTECTION

A. Clean and protect fire extinguisher cabinets for the duration of the construction period.

B. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair.

END OF SECTION

SECTION 10 51 13
METAL LOCKERS

PART 1 GENERAL

1.01 REFERENCES

A. ASTM (ASTM International)
   1. D2197 “Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion”
   2. D2794 “Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)”
   3. D6578 “Standard Practice for Determination of Graffiti Resistance”
   4. E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”

1.02 SYSTEM DESCRIPTION

A. Provide lockers in sizes and configurations indicated in the Drawings.
   1. Verify locker sizes, configurations, locking, accessories, numbering, and finishes with the Owner prior to submittal of shop drawings.
   2. Each locker shall have a door mounted in a frame. Individual top, bottom, side, back, shelves, with a common side separating compartments, where applicable.
   3. Provide lockers with prefinished, sloped tops matching locker finish.

B. The paint used shall be a powder coating completely free of all lead and chromate.

1.03 SUBMITTALS

A. Submit Product Data.
   1. Submit manufacturer’s detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fasteners, and accessories.

B. Submit Shop Drawings.
   1. Furnish shop drawings in quantities requested for fabrication and installation of metal lockers and locker accessories, as indicated.
   2. Include plans, elevations, sections, numbering, colors, details, and anchorages/ attachments to other work.

C. Submit Samples.
   1. Submit physical samples of each color and finish for color verification.

D. Submit Warranty Documentation.
   1. Submit manufacturer’s written warranty for products used.

1.04 QUALITY ASSURANCE

A. When tested in accordance with ASTM E84, lockers and locker accessory materials shall meet or exceed all requirements for Class A flame spread rating and smoke developed index and shall carry a Class A fire rating certification in accordance with the requirements of the National Fire Protection Association (NFPA) and the International Code Council (ICC).
   1. Maximum Flame Spread Index: 25.

2. Maximum Smoke Developed Index: 450.

B. When tested in accordance with ASTM D6578, locker materials shall prove resistant to all chemicals tested for a period of 1 to 10 minutes and shall leave no mar or blemish on the surface when cleaned.

1. Locker materials shall have guaranteed surface cleanability from permanent markers and shall have non-ghosting properties.

C. When tested in accordance with ASTM D2197, locker materials shall prove to be scratch resistant when the maximum load value exceeds 10 kilograms.

D. When tested in accordance with ASTM D2794, locker materials shall withstand an impact force value in excess of 45 inch-pounds.

1.05 WARRANTY

A. Provide manufacturer's two (2) year written limited warranty against breakage, corrosion and defects in workmanship of all metal locker components.

1. Manufacturer's warranty excludes vandalism and improper installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Approved Product: Emperor metal lockers, as manufactured by Hadrian Manufacturing, Inc.

1. Provide lockers in sizes and configurations as indicated in the Drawings.
2. Provide locker accessories as indicated in the Drawings and these Specifications.

2.02 MATERIALS

A. All locker parts shall be made of mild cold rolled, galvanneal sheet steel, free from surface imperfections and contaminants which would be detrimental to the acceptance of a high grade hybrid epoxy polyester powder finish.

1. Assembly fasteners shall be zinc plated flat head screws with hex nuts.

B. Doors shall be of a double-pan design consisting of a 16-gauge outer panel welded to a 24-gauge inner panel to form a rigid box construction that resists prying.

1. The outer panel shall be double flanged on all four edges and the inner panel single flanged on all four edges, providing extraordinary rigidity when both panels are welded together.
2. A structural and sound deadening 1-inch cell honeycomb core is bonded to the inner surfaces.
3. The door shall be flush with the frame and include a recessed handle and recessed number plate, both of which eliminate protruding parts.
4. Doors are hinged on the right and swing from left to right

C. Both vertical door frame members shall be not less than 16-gauge and formed into a rigid channel 5/8-inch wide exposed frame and 2-7/16 inch side depth.

1. The frame shall be completed by 3 inch high top and bottom cross members of not less than 18-gauge formed as an open box channel and welded to the verticals.
2. The bottom frame's full-width lintel extends back and down to form a rigid box to support the bottom shelf.
3. Both vertical frame members shall be formed to offer a full-length 7/16 inch wide continuous door strike.

4. The latch vertical member shall include a welded 11-gauge padlock hasp together with a 7/16 inch outside diameter, air-cushioned rubber bumper.
5. No fasteners shall be exposed on fronts of locker doors and frames.

D. Sides and backs shall be no less than 24-gauge and should not contain extra unnecessary holes unless otherwise specifically used for the assembly of the lockers and accessories on the project.
1. Edges shall be formed to provide a strong and rigid assembly when bolted or riveted together.
2. Locker backs are flanged at right angles providing a triple thickness of metal at the back corner connections.
3. Shelves, tops and bottoms shall be interchangeable; not less than 22-gauge and formed into a sturdy pan with a lip formed front edge for additional strength and safety.

E. Provide the manufacturer's standard, recessed, individual galvanneal box bases raising lockers off the floor by 3-1/2 inches and allowing for toe space and protection against damage from cleaning.

F. Trouble-free use is achieved with no sliding rods, springs, turnhandles or moving latches.
1. An 11-gauge 2-inch by 3/4 -inch padlock hasp shall be securely welded to the continuous strike midway up on the frame and centered at the handle location.
2. The hasp shall be formed to protrude through an extruded aluminum recessed handle, which is cliplocked and bonded to the door.
3. The handle's inner surface shall be concave and grooved for fingertip door control.
4. To keep the door closed when not in use, a 1/2-inch outside diameter nylon friction catch shall be installed on the door to engage the frame in four (4) locations.
5. Padlock is standard. For built-in locks (combination, key or coin/card operated) the hasp shall be replaced with a special 11-gauge security strike welded to the frame's continuous door strike.
6. The lock bolt shall secure itself behind the strike.
7. Access to the secured bolt shall be denied by the full-length stop on the door frame and by the top lip of the strike projecting forward and fitting into a slot in the door, preventing the door and frame from being pulled apart

G. A full-length 18-gauge continuous piano hinge shall be securely welded to the frame and fastened to the door with screws or rivets.
1. Hinge shall maximize security and enhance resistance to abuse and vandalism.

H. Airflow is achieved through 4 sets of 5 unobstructed louvers 3/4-inch wide by 1/4-inch high in the vertical frame members.
1. Provide 18 each 3/16-inch diameter perforations at outside perimeter of each top, shelf, and bottom to offer additional ventilation throughout the inside of each locker.

I. Each door shall have a high strength black laminated plastic number plate, 2-1/2 inches wide by 1-1/8 inch high, with white numbers not less than 7/16-inch high.
1. Plates shall accommodate up to four digits, be nestled in a recess flush with door surface and shall be fastened to door with two rivets.
2. Verify numbering sequence with the Owner prior to fabrication.

J. Standard equipment in the single-tier locker shall be one hat shelf and three single prong coat hooks.
1. Double prong coat hooks and 1-inch outside diameter coat rods with stainless steel brackets shall also be provided.

2. All hooks are chrome plated steel with ball point heads and attached to shelves with two fasteners.

2.03 FINISHES

A. All steel parts and aluminum pedestals shall be thoroughly machine cleaned, phosphatised, and finished with a high performance epoxy powder coating, baked on to provide a uniform, smooth, protective finish.

1. Colors shall be as indicated in the Drawings, of if not indicated, as selected by the Owner from Hadrian's standard color card, including anti-graffiti and special effects colors.
2. Locker frames to be standard as Black #510, unless indicated otherwise in the Drawings.
3. All interior body parts are finished in standard Light Grey #535.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Inspect walls to insure that they are plumb and suitable for the installation of the Lockers.

C. Check location of built up bases, pedestals, built in framing or blocking, and wall openings to insure that they are coordinated with locker sizes and configurations.

D. Correct any inappropriate or unacceptable conditions before beginning installation.

3.02 INSTALLATION

A. Comply with manufacturer's written installation instructions.

B. Install lockers and locker accessories rigid, straight, plumb, and level.

C. Through bolt locker boxes together with stainless steel theft proof torx head with pin, through bolts.

D. Anchor locker boxes to the wall with anchor devices provided or recommended by the locker manufacturer.

E. Install slope tops, end panels, filler strips and accessories in accordance with the manufacturer's written instructions.

3.03 CLEANING AND PROTECTION

A. Adjust hardware according to manufacturer's written instructions for proper operation.

B. Provide final protection and maintain conditions that ensure lockers are without damage or deterioration at the time of substantial completion.

1. Clean all exposed surfaces of lockers and hardware.

C. Replace lockers that are damaged, defective, or that exhibit color or finish variation from finishes specified.

END OF SECTION

SECTION 12 21 00
WINDOW BLINDS

PART 1 GENERAL

1.01 REFERENCES

A. ASTM (ASTM International)
   1. E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”

B. WCMA (Window Covering Manufacturers Association)
   1. A100.1 "Standard for Safety of Corded Window Covering Products"

1.02 SUBMITTALS

A. Submit Shop Drawings.
   1. Window blind sizes and mounting/support details.

B. Submit Product Data.
   1. Window blind manufacturer’s product technical literature.
   2. Fire test data and affidavits required by authorities having jurisdiction for exposed materials, assemblies, and finishes demonstrating compliance with code-required maximum allowable flame spread and smoke-developed index ratings.

C. Submit Samples.
   1. Window blind finishes

D. Submit Warranty Documentation.
   1. Window blind warranty

1.03 QUALITY ASSURANCE

A. Provide “Class C” (Flame Spread Index of 200 or less, tested per ASTM E84) rated window blinds.
   1. Provide affidavits substantiating classification if requested by the Architect or Authorities Having Jurisdiction.

B. Maximum Smoke Developed Index: 450 (tested per ASTM E84).
   1. Provide affidavits substantiating classification if requested by the Architect or Authorities Having Jurisdiction.

C. Corded Window Covering Product Standard: Unless otherwise indicated, comply with WCMA A100.1.

1.04 WARRANTY

A. Minimum Horizontal Window Blind (Mini-blind) Warranty Period: 1 year.

PART 2 PRODUCTS

2.01 HORZONTAL LOUVER BLINDS

A. Louver Slats: Extruded vinyl recommended by producer for type of use and finish indicated, with crowned profile and radiused corners.

B. Nominal Slat Width: 1 inch.

C. Slat Spacing: Manufacturer's standard spacing.

D. Headrail: Formed steel, extruded aluminum, or extruded vinyl.
   1. Headrail Dimensions: Nominal 1 inch by 1 inch.
   2. Long edges returned or rolled.
   3. Fully enclosing operating mechanisms on three sides and ends.

E. Headrail Valence: Integral or applied decorative valence of extruded vinyl of aluminum.
   1. Provide manufacturer's standard valence as required to conceal headrail operating mechanisms from front and side views.

F. Bottom Rail: Formed-steel or extruded-aluminum tube, sealed with plastic or metal capped ends.
   1. Provide bottom rails with enclosed and protected ladders and tapes to prevent their contact with sill.
   2. Top contoured to match crowned shape of louver slat.
   3. Bottom contoured for minimizing light gaps.

G. Tilt Control: Enclosed worm gear mechanism, slip clutch or detachable wand preventing over rotation, and linkage rod.
   1. Tilt Operation: Manual with clear plastic wand or cord-operated tilter.
   2. Length of Tilt Control: Length required to make operation convenient from floor level.
   3. Tilt: Full.

H. Lift Operation: Manual, cord lock; locks pull cord to stop blind at any position in ascending or descending travel.

I. Ladders: Evenly spaced to prevent long-term louver sag.

J. Mounting: Wall, Ceiling, End, or Wall extension brackets as required, permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes.
   1. Provide spacers and shims as required for blind placement and alignment indicated.
   2. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.

K. Finishes: White.

2.02 HARDWARE

A. Provide window blinds with the manufacturer's standard hardware.
   1. Provide all mounting accessories and fasteners required for a complete installation and proper operation.

PART 3 EXECUTION

3.01 PREPARATION

A. Field-verify all window blind dimensions after installation of all framing components but before fabrication of window blind units.
   1. Verify locations and sizes of blinds.
   2. Report deviations and proposed modifications to the Architect.

B. Verify adequacy of substrates, required backing and support framing.

1. Report deviations and proposed modifications to the Architect.
2. Do not begin installation until conditions and material substrates are acceptable.

3.02 INSTALLATION

A. Install window blinds in strict accordance with the manufacturer's written instructions and recommendations for each application.

B. Install blinds level and plumb and aligned with adjacent units.
   1. Install intermediate support as required to prevent deflection in headrail.
   2. Allow clearances between adjacent blinds and for operating glazed opening's operation hardware, if any.
   3. Mount louver blinds so that exterior louver edges in any position are not closer than 1 inch to interior face of glass.

C. Mounting Method: Install blinds flush, jamb, head, or recessed mounting, as appropriate to each application.

D. Adjusting: Adjust horizontal louver blinds to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

E. Test louver blinds for proper operation.
   1. Correct deficiencies.

F. Cleaning: Clean blind surfaces after installation, according to manufacturer's written instructions.

END OF SECTION

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SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Work of this Section includes provision of all materials and installation for a complete pre-engineered metal building, as described in the Drawings and Specifications, including the following materials and assemblies.

1. Primary and secondary structural framing members.
2. Complete covered entrance canopies, including all structure above foundation, roofing, soffit, fascia, trim, and all finishes.
3. Anchorage of primary structural framing members to foundation assemblies.
4. Bracing of pre-engineered metal building structures.
5. Pre-finished metal panels for roofing and siding.
6. Insulation at exterior walls and roof assemblies, including batt insulations in framing cavities.
7. Pre-finished metal roof ridge caps, drip edges, rake and fascia trims, equipment supports, and other roof trims and anchorages.
8. Pre-finished metal soffit panels.
9. Supplemental framing for openings in metal panel roofs and walls for doors, windows, utilities, equipment, and other penetrations indicated in the Drawings.
10. Openings, flashings, and trims in metal panel roofs and walls for doors, windows, utilities, equipment and other penetrations indicated in the Drawings.
11. Pre-finished corner trims, window and door opening trims, infills, caps, closures, and other accessory trims for metal panel walls.
12. Flashings, fasteners, sealants, accessories.
13. Pre-finished metal liner panels at interior side of exterior walls and roofs, as indicated, including trims and accessories.
14. All other miscellaneous component parts required for a complete building structure and enclosure.

1.02 RELATED SECTIONS

A. Concrete Footings, Foundations, and Slabs on Grade: Division 03 Sections.

B. Sill Seal Gaskets: Section 07 21 00 “Thermal and Acoustic Insulation”

C. Continuous Rigid Board Insulations: Section 07 21 00 “Thermal and Acoustic Insulation”

D. Snow Guards: Section 07 71 00 “Roof Specialties and Accessories”

E. Hollow Metal Doors and Frames: Section 08 11 00 “Metal Doors and Frames”

F. Structural Steel Framing and Metal Fabrications Not Provided as Part of the Metal Building System Package: Division 05 Sections.

G. Interior Light Gage Metal Framing: Section 092216 “Non-Load-Bearing Cold-Formed Metal Framing”

1.03 REFERENCES

A. AAMA (American Architectural Manufacturers Association)
   1. 2604 “Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels”

B. AISC (American Institute of Steel Construction)
   1. 303 “Code of Standard Practice for Steel Buildings and Bridges”
   2. 326 “Detailing for Steel Construction”
   3. 360 “Specification for Structural Steel Buildings”

C. AISI (American Iron and Steel Institute)
   1. D100 “Cold-Formed Steel Design Manual”
   2. D111 “Design Guide For Cold-Formed Steel Purlin Roof Framing System”
   3. SG-971-Spec “North American Specification for the Design of Cold-Formed Steel Structural Members”
   4. S100 “North American Specification for the Design of Cold-formed Steel Structural Members”
   5. S220 “North American Standard for Cold-formed Steel Framing – Nonstructural Members”
   6. S240 “North American Standard for Cold-formed Steel Structural Framing”
   7. S400 “North American Standard for Seismic Design of Cold-formed Steel.

D. ASTM (ASTM International)
   1. A36 “Standard Specification for Carbon Structural Steel”
   2. A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”
   3. A153 “Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware”
   4. A193 “Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications”
   5. A307 “Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods, 60,000 PSI Tensile Strength”
   6. A325 “Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength”
   7. A490 “Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength”
   8. A500 “Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes”
   9. A501 “Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing”
   10. A563 “Standard Specification for Carbon and Alloy Steel Nuts”
   11. A572 “Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel”
   12. A653 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”
   13. A755 “Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products”

14. A792 “Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process”
15. A992 “Standard Specification for Steel for Structural Shapes For Use in Building Framing”
16. A1008 “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability”
17. A1011 “Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability”
18. B695 “Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel”
19. C518 “Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus”
20. C920 “Standard Specification for Elastomeric Joint Sealants”
21. C991 “Standard Specification for Flexible Glass Fiber Insulation for Metal Buildings”
22. C1107 “Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)”
23. C1136 “Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation”
24. C1363 “Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus”
25. D2244 “Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates”
26. D4214 “Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films”
27. E96 “Standard Test Methods for Water Vapor Transmission of Materials”
28. E1592 “Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference”
29. E1646 “Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference”
30. E1680 “Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems”
31. F436 “Standard Specification for Hardened Steel Washers”
32. F844 “Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use”
33. F1554 “Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength”
34. F1852 “Standard Specification for Twist Off Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength”

E. AWS (American Welding Society)
   1. D1.1 “Structural Welding Code – Steel” (ANSI)
   2. D1.3 “Structural Welding Code – Sheet Metal” (ANSI)

F. MBMA (Metal Buildings Manufacturers Association)
   1. “Metal Building Systems Manual”

G. NRCA (National Roofing Contractors Association)
   1. “Roofing and Waterproofing Manual”

H. RCSC (Research Council on Structural Connections)

1. “Specification for Structural Joints Using ASTM A325 or A490 Bolts,” June 23, 2000

I. SMACNA (Sheet Metal and Air Conditioning Contractors National Association)
1. “Architectural Sheet Metal Manual”

J. SSPC (Steel Structures Painting Council)
1. Paint 12 “Cold-Applied Asphalt Mastic (Extra Thick Film)”
2. Paint 15 “Steel Joist Shop Primer”
3. SP-2 “Hand Tool Cleaning”
4. SP-3 “Power Tool Cleaning”

K. UL (Underwriters Laboratories)
1. 580 “Standard for Tests for Uplift Resistance of Roof Assemblies”

1.04 SYSTEM DESCRIPTION

A. Provide pre-engineered metal building system structures, enclosures, insulations, and finishes meeting applicable building codes, industry standards, and the manufacturer’s recommendations, except where more stringent requirements are indicated in these Contract Documents.

B. Structural Properties of Cold-formed Steel Framing Members: AISI D100.

C. Structural Design of Cold-formed Steel Framing Members: AISI S100.

D. Seismic Design of Cold-formed Steel Framing: AISI S400.

E. Standard for Cold-formed Structural Steel Framing: AISI S240.

F. Standard for Cold-formed Non-structural Steel Framing: AISI S220.

G. Standard for the Design of Cold-Formed Steel Purlin Roof Framing Systems: AISI D111.

H. Provide metal building systems capable of withstanding the effects of gravity and lateral loads and the following loads and stresses within limits and under conditions indicated.
1. Engineer metal building systems according to procedures in MBMA "Metal Building Systems Manual."
2. Take all anticipated loads and load combinations into engineered design consideration, including dead loads, collateral loads, snow loads, wind loads, seismic loads, live loads, and auxiliary dynamic loads (such as, but not limited to, those imposed by cranes, and other material handling systems).
3. Design Loads: As indicated on Drawings.

I. Provide metal panel roof, wall, and ceiling/soffit 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.
1. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

J. Provide insulated assemblies with the following minimum R-values for opaque elements when tested according to ASTM C1363 or ASTM C518:
1. Exterior Walls: R-9.8 continuous, R-25 cavity.
2. Roof/Ceilings: R-13 continuous, R-25 cavity.

K. Provide metal roof and exterior wall panel systems tested in accordance with ASTM E1592 for positive- and negative-pressure loading, as applicable.

L. Provide metal roof panel systems having a maximum air infiltration rate of 0.0007 cubic feet per minute per square foot, at a pressure differential of 6.24 pounds per square foot, when tested in accordance with ASTM E1680.

M. Provide metal roof panels and concealed anchor clips capable of supporting a 300-pound temporary concentrated load at the panel mid-span in the installed condition.
   1. The load shall be applied over the entire roof panel width.
   2. The panels shall support this concentrated load without displaying permanent distortion that would affect the appearance or weather-tightness of the roof system.

N. Provide metal panel roof systems exhibiting no water leakage at a pressure differential of 6.24 pounds per square foot when tested in accordance with ASTM E1646.

O. Provide metal roof panel assemblies that comply with UL 580.
   1. Minimum Class for Wind Uplift Resistance: 90.

1.05 SUBMITTALS

A. Submit Shop Drawings.
   1. Plans, sections, elevations, details (including metal panel profiles), and attachments to other work.
   2. Anchor bolt layouts and engineered calculations with foundation reactions.
   3. Flashings, trims, sealants and metal building system accessories.
   4. Information required for connections to other Work.

B. Submit Product Data.
   1. Metal building manufacturer’s product literature.

C. Submit Samples.
   1. Exposed prefinished metal finishes.

D. Submit Certifications.
   1. Letter of Design Certification, signed and sealed by a professional engineer registered in the State of Michigan.
   2. Welding certificates.
   3. Erector certificates.

E. Submit Test Results.
   1. Reports from quality control testing.
   2. Written reports from special inspections.

F. Submit Warranty Documentation.
   1. Metal building manufacturer’s finishes warranty.

1.06 QUALITY ASSURANCE

A. Use 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 approved by the metal building manufacturer.

B. Provide metal buildings by a qualified manufacturer who is a 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. Qualify welding procedures and personnel according to AWS D1.1 and AWS D1.3.

D. Comply with AISC 303, AISC 326, and AISC 360.

E. Comply with AISI SG-971-Spec and AISI D100.

F. Provide water-tight metal roof assemblies following NRCA “Roofing and Waterproofing Manual.”

G. Conduct a pre-erection conference at the Project site.

1. Review methods and procedures related to metal building systems including condition of foundations and other preparatory work performed by other trades.
2. Review required testing, inspecting, and certifying procedures.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering.

1. Store metal panels to ensure dryness and with positive slope for drainage of water.
2. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

1.08 PROJECT CONDITIONS

A. Established Dimensions for Foundations.

1. Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements.
2. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.

1.09 COORDINATION

A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings.

B. Coordinate erection of metal building with the work of all other trades, including all site work, utilities, architectural, mechanical, and electrical work.

1.10 WARRANTY

A. Manufacturer's standard form warranty in which the manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within the specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to color fading more than 5 Hunter units when tested according to ASTM D2244, chalking in excess of a No. 8 rating when tested according to ASTM D4214, and cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following manufacturers:
   1. Alliance Steel, Inc.
   2. American Buildings Company.
   3. American Steel Building Company, Inc.; Division of NCI Building Systems, LLP.
   4. Behlen Mfg. Co.
   5. Butler Manufacturing Company.
   6. Ceco Building Systems; Division of Robertson-Ceco Corporation.
   7. Crown Metal Buildings, Inc.
   8. Garco Building Systems.
   9. Gulf States Manufacturers, Inc.
   10. Kirby Building Systems (A Nucor Company).
   11. Mesco Metal Buildings; Division of NCI Building Systems, LLP.
   12. Metallic Metal Building Company; Division of NCI Building Systems, LLP.
   13. Nucor Building Systems.
   14. Package Industries, Inc.
   15. Southern Structures, Inc.
   16. Spirco Manufacturing; Division of Metal Building Products, Inc.
   17. Star Building Systems; Division of Robertson-Ceco Corporation.
   18. Steelox Systems Inc.
   19. United Structures of America, Inc.
   20. VP Buildings, Inc.; a United Dominion Company.

2.02 STRUCTURAL FRAMING MATERIALS

A. W-Shapes: ASTM A992.
   1. Grade: 50.

B. HP-Shapes (steel piles): ASTM A572.
   1. Grade: 50.

C. M-Shapes and S-Shapes: ASTM A36.

D. Plates, Bars, Angles, Channels, and Miscellaneous Fabrications: ASTM A36.

E. Steel Sheet: ASTM A1008.

F. Steel Pipe: ASTM A53.
   1. Type: E/S.
   2. Grade: B.

G. Square and Rectangular HSS (Tube Steel): ASTM A500.
   1. Grade: B.

H. Round HSS (Steel Pipe): ASTM A501.
   1. Grade: B.

I. Hot-Rolled Structural Steel Sheet: ASTM A1011, Structural Steel (SS).

1. Grades: 30 through 55.

J. Cold-Rolled Structural Steel Sheet: ASTM A1008, Structural Steel (SS)
   1. Grades: 25 through 80.

K. Metallic-Coated Steel Sheet: ASTM A653, Structural Steel (SS).
   1. Grades: 33 through 80.
   2. Coating Designation: G60; mill phosphatized.

L. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A755.

M. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, Structural Steel (SS).
   1. Grades: 33 through 80.
   2. Coating Designation: G60; mill phosphatized.

N. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, Structural Steel (SS).
   1. Grade: 50 or 80.
   2. Coating Class AZ50.

2.03 METAL PANEL MATERIALS

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 A755.
   1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, Structural Steel (SS), Grade 50 or 80; with Class AZ50 coating designation.
   2. Surface: Smooth, flat finish.

B. Metal Liner Panels: Factory-formed metal liner panels designed for interior side of field-assembled metal wall panel assemblies and field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps.
   1. Material: Metallic-coated steel sheet.
   2. Minimum Metal Thickness: 0.0269 inches (26 gage).
   3. Texture: Smooth.
   4. Profile: Ribbed.
   5. Include accessories required for a complete installation, including J-channel (or other profile, as appropriate) trim for all corners, penetrations, and all perimeters where panels meet dissimilar finishes.

2.04 METAL PANEL FINISHES

A. Roof Panel Finishes: Natural corrosion-resistant metal finish.

B. Exterior Wall Panel Finishes: Apply the following coil coating, as specified or indicated on Drawings:
   1. 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, pre-treat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.
   2. Color: As indicted on the Drawings

3. 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.

C. Exposed Interior Metal Liner Panel Finish: Siliconized-polyester coating.
1. Minimum Epoxy Primer Dry-Film Thickness: 0.2 mil.
2. Minimum Topcoat Dry-Film Thickness: 0.8 mil.
3. Color: White.
4. Trim Color: Matching panels.

2.05 THERMAL INSULATION MATERIALS

A. Metal Building Batt Insulation: ASTM C991, Type I, or Type II, glass-fiber-blanket insulation; 0.5 pounds per cubic foot density; 2-inch- wide, continuous, vapor-tight edge tabs; and with a flame-spread index of 25 or less.
1. Minimum R-Value per Inch of Batt Thickness: 3.

B. Vapor-Retarder Facing: ASTM C1136, with permeance not greater than 0.02 perm when tested according to ASTM E96, Desiccant Method.
1. Composition: Polypropylene or vinyl film facing.
2. Color: White.
3. Use vapor retarder facings on interior surfaces of batt insulation only.

C. Retainer Strips: 0.019-inch-thick, formed, galvanized steel or PVC retainer clips in color matching insulation facing.

D. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.06 EXTERIOR TRIM MATERIALS

A. Roof Fascia and Rake Trim: Metal building manufacturer’s standard pre-finished, corrosion-resistant metal fascia and rake trim and installation accessories.
1. Provide trim materials designed to be used with adjacent roofing and soffit materials
2. Color: As indicated in the Drawings.

B. Exterior Soffit: Metal building manufacturer’s standard pre-finished, corrosion-resistant metal soffit panels, trims, and installation accessories.
1. Color: As indicated in the Drawings.

C. Exterior Corner and Perimeter Trim: Metal building manufacturer’s standard pre-finished, corrosion-resistant metal corner and perimeter trim and installation accessories.
1. Provide trim materials designed to be used with adjacent metal panel sidings.
2. Color: As indicated in the Drawings.

2.07 CONNECTORS AND FASTENERS

A. Non-High-Strength Bolts, Nuts, and Washers: ASTM A307, Grade A, carbon-steel, hex-head bolts; ASTM A563 carbon-steel hex nuts; and ASTM F844 plain (flat) steel washers.
1. Finish: Plain or mechanically deposited zinc coating, ASTM B695, Class 50.

B. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.
1. Finish: Plain or mechanically deposited zinc coating, ASTM B695, Class 50.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, heavy-hex-head steel structural bolts with splined ends.
   1. Finish: Plain or mechanically deposited zinc coating, ASTM B695, Class 50.

D. High-Strength Bolts, Nuts, and Washers: ASTM A490, Type 1, heavy hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers, plain.

E. Unheaded Anchor Rods: ASTM F1554 (Grade 36), ASTM A572 (Grade 50), ASTM A36, or ASTM A307 (Grade A).
   1. Configuration: Straight.
   2. Nuts: ASTM A563 heavy hex carbon steel.
   3. Plate Washers: ASTM A 36 carbon steel.
   4. Washers: ASTM F436 hardened carbon steel.
   5. Finish: Hot-dip zinc coating, ASTM A153, Class C.

F. Headed Anchor Rods: ASTM F1554 (Grade 36) or ASTM A307 (Grade A), straight.
   1. Nuts: ASTM A563 heavy hex carbon steel.
   2. Plate Washers: ASTM A36 carbon steel.
   3. Washers: ASTM F436 hardened carbon steel.
   4. Finish: Hot-dip zinc coating, ASTM A153, Class C.

G. Threaded Rods: ASTM A193, ASTM A572 (Grade 50), ASTM A36, or ASTM A307 (Grade A).
   1. Nuts: ASTM A563 heavy hex carbon steel.
   2. Washers: ASTM F436 (hardened) or ASTM A36, carbon steel.
   3. Finish: Finish: Plain or mechanically deposited zinc coating, ASTM B695, Class 50.

H. Metal Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
   1. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
   2. 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.
   3. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with nylon or polypropylene washer.

2.08 COATINGS AND MISCELLANEOUS MATERIALS

A. Primer: SSPC Paint 15.
   1. Type: I, red oxide.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC Paint 12, compounded for 15-mil dry film thickness per coat.
   1. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, 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 C920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant.

2.09 FABRICATION

A. Tolerances: Comply with MBMA "Metal Building Systems Manual."

B. Metal Panels: Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

C. Shop-fabricate primary framing components to indicated size and section with base plates, bearing plates, stiffeners, and other items required for erection welded into place.
   1. Cut, form, punch, drill, and weld framing for bolted field assembly.
   2. Make shop connections by welding or by using high-strength bolts.
   3. Join flanges to webs of built-up members by a continuous submerged arc-welding process.
   4. 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.
   5. Prepare surfaces for shop priming according to SSPC SP-2.
   6. Shop prime primary structural members with specified primer after fabrication.

D. Shop-fabricate secondary framing components to indicated size and section by roll-forming or break-forming, with base plates, bearing plates, stiffeners, and other plates required for erection welded into place.
   1. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
   2. Prepare uncoated surfaces for shop priming according to SSPC SP-2.
   3. Shop prime uncoated secondary structural members with specified primer after fabrication.

E. Provide the manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements.
   1. Provide frames with attachment plates, bearing plates, and splice members.
   2. Factory drill for field-bolted assembly.
   3. Provide frame span and spacing indicated.
   4. 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.
   5. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipe or tube, or shop-welded, built-up steel plates.
   6. Frame Configuration: As indicated in Drawings.
   7. Exterior Column Type: As indicated in Drawings.
   8. Rafter Type: As indicated in Drawings.

F. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
   1. End-Wall Corner Columns: Single, free-spanning across entire building width, to facilitate future bay additions.

2. Intermediate End-Wall 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.

G. 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, as required to meet structural requirements and provide adequate support for insulations, decking, sheathing, liner panels, and metal wall and roof panels, as applicable.

1. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet pre-painted with coil coating, unless otherwise indicated.
2. 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.
3. Depth: As required to comply with system performance requirements.
4. 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.
5. Depth: As required to comply with system performance requirements.
6. 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.
7. 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.
8. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles or 1/2 inch diameter steel rods.
9. Base or Sill Angles: Minimum 3-by-2-by-0.0598-inch zinc-coated (galvanized) steel sheet.
10. Purlin and Girt Clips: Minimum 0.0598-inch-thick, steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
11. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0598-inch-thick structural-steel sheet.
12. 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.
13. 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.

H. Provide wind bracing using the manufacturer’s standard design method.

I. Bolts: Provide plain finish bolts for structural-framing components that are primed or finish painted.

1. Provide hot-dipped galvanized bolts for structural-framing components that are galvanized.

J. Factory-Primed Finish: Apply specified primer immediately after cleaning and pre-treating.

1. Clean framing members to remove loose rust and mill scale.
2. Prime primary, secondary, and end-wall structural-framing members to a minimum dry film thickness of 1 mil.

3. Prime secondary steel framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.
4. Prime galvanized members with specified primer, after phosphoric acid pretreatment.

K. Trapezoidal-Rib, Standing-Seam Metal Roof Panels: Formed with raised trapezoidal ribs at panel edges and intermediate stiffening ribs symmetrically spaced or flat pan 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: Aluminum-zinc alloy-coated steel sheet, minimum 0.0179 inches thick (26 gage).
2. Clips: Manufacturer's standard type to accommodate thermal movement]; fabricated from corrosion-resistant material compatible with roofing and framing members attached.
3. Joint Type: Mechanically seamed, folded as standard with manufacturer.
4. Panel Coverage: 24 inches.
5. Panel Height: 3 inches.

L. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced or flat pan 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: Aluminum-zinc alloy-coated steel sheet, minimum 0.0179 inches thick (26 gage).
2. Exterior Finish: Fluoropolymer.
3. Major-Rib Spacing: 12 inches on-center.
4. Panel Coverage: 36 inches.
5. Panel Height: 1.5 inches.

M. Provide accessories as standard with metal building system manufacturer and as specified, including all accessories required for complete framing system, roof panel, ceiling/soffit panel, and wall panel installation.
1. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes.
2. Comply with indicated profiles and with dimensional and structural requirements.
3. Provide all flashing and trims formed from minimum 0.0159-inch-thick, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating; finished to match adjacent metal panels.

2.10 SOURCE QUALITY CONTROL

A. Special Inspector: Owner will engage a qualified special inspector to perform required tests and inspections and to submit reports.
1. Special Inspector will verify that manufacturer maintains detailed fabrication and quality-control procedures and will review the completeness and adequacy of those procedures to perform the Work.
2. 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.
3. After fabrication, submit certificate of compliance with copy to authorities having jurisdiction certifying that Work was performed according to Contract requirements.

B. Bolted Connections: Shop- and field-bolted connections shall be tested and inspected according to RCSC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

C. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1.

PART 3 EXECUTION

3.01 ERECTION

A. Before erection proceeds survey building dimensions, elevations, and locations of bearing surfaces, 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.

1. 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.

1. 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.

1. Clean bottom surface of plates.
2. Set plates for structural members on wedges, shims, or setting nuts as required.
3. Tighten anchor rods after supported members have been positioned and plumbed.
4. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
5. Where required to be grouted, promptly pack grout solidly between bearing surfaces and plates so no voids remain.
6. Neatly finish exposed surfaces; protect grout and allow to cure.
7. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

G. Align and adjust structural framing before permanently fastening.

1. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing.
2. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
3. Level and plumb individual members of structure.

H. Erect primary and end-wall framing true to line, level, plumb, rigid, and secure.

1. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts.

2. 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.
3. Make field connections using high-strength bolts installed according to RCSC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and snug-tightened or pretensioned joints, as specified by the metal building design engineer.

I. Erect secondary framing true to line, level, plumb, rigid, and secure.
1. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts.
2. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
3. Locate and space wall girts to suit openings such as doors and windows.
4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

J. Install bracing in roof and sidewalls where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

K. Provide framing for opening using shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work.
1. Securely attach opening framing to structural framing.

L. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.02 METAL PANEL INSTALLATION - GENERAL

A. 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.
2. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
3. Field cutting of metal panels by torch or wheel is not permitted; use nibbler-type shears as recommended by the panel manufacturer.
4. Install metal panels perpendicular to structural supports, unless otherwise indicated.
5. Flash and seal metal panels with weather closures at perimeter of openings and similar elements; fasten with self-tapping screws.
6. 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.
7. Attach metal panels through continuous rigid insulation boards, as indicated in the Drawings.
8. Do not rely on continuous rigid insulation for structural support of metal panels.
9. Lap metal flashing over metal panels to allow moisture to run over and off the material.

B. Install lap-seam metal panels using screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or metal panels.
1. Install screws in predrilled holes.
2. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints.

3. Lap ribbed or fluted sheets one full rib corrugation.

C. 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. Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies.

1. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal panel manufacturer.

3.03 METAL ROOF PANEL INSTALLATION

A. Provide metal roof panels of full length from eave to ridge, unless otherwise indicated or restricted by shipping limitations. Install ridge and hip caps as metal roof panel work proceeds.

B. Fasten standing-seam metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by the manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Attach metal panels through continuous rigid insulation boards, as indicated in the Drawings.
3. Do not rely on continuous rigid insulation for structural support of metal panels.
4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction; predrill panels for fasteners.
6. Provide metal closures at peaks, rake edges, rake walls, and each side of ridge and hip caps.

C. 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.

3.04 METAL WALL PANEL INSTALLATION

A. Install metal wall panels in orientation, sizes, and locations indicated on the Drawings.

1. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated.
2. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
3. When two rows of metal panels are required, lap panels 4 inches minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction.
6. Pre-drill panels.
7. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
8. Install screw fasteners in predrilled holes.

9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated, or if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Install metal wall panels on exterior side of girts, attaching metal wall panels to supports with fasteners as recommended by manufacturer.
1. Attach metal panels through continuous rigid insulation boards, as indicated in the Drawings.
2. Do not rely on continuous rigid insulation for structural support of metal panels.

C. Install interior metal liner panels in accordance with the manufacturer's installation instructions with tight-fitting joints to achieve a clean, consistent appearance.
1. Provide for accommodation of thermal movement as recommended by the panel manufacturer.
2. Maintain the integrity of the air and moisture vapor barrier on exterior walls.

3.05 THERMAL INSULATION INSTLLATION FOR FIELD-ASSEMBLED METAL PANELS

A. Install insulation concurrently with metal wall panel installation, in thickness indicated to cover entire wall, according to manufacturer's written instructions.
1. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths with both sets of facing tabs sealed to provide a complete vapor retarder.
4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation with both sets of facing tabs sealed to provide a complete vapor retarder.

B. Continuous Rigid Insulation Installation: Install continuous rigid insulations in proper sequence to provide a continuous thermal break between building framing members and wall/roof panels.
1. Follow rigid insulation manufacturer's installation instructions.
2. Use mechanical fasteners to secure rigid insulation to building framing members.
3. Use expanding foam sealants, tapes, and caulks to seal insulation perimeter joints and all penetrations, to form a continuous air and water barrier at the exterior plane of the insulation.
4. Provide all flashings, trims, and accessories required for a complete installation.

C. Blanket Roof Insulation: Comply with one of the following installation methods:
1. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder facing tabs up and over purlin, overlapping adjoining facing of next insulation course maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.
2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

D. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members.

1. Hold in place by metal wall panels fastened to secondary framing.
2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.06 ACCESSORIES INSTALLATION

A. 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 "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. Pipe Flashing: Form flashing around pipe penetration and metal roof panels.
   1. Fasten and seal to panel as recommended by manufacturer.

3.07 INTERIOR METAL LINER PANEL INSTALLATION

A. Install interior metal wall and ceiling panels in locations indicated on the Drawings.
   1. Comply with the metal panel manufacturer’s written installation instructions for erection and fastening of panels to substrate and framing materials.
   2. Install panels perpendicular to girts, unless otherwise indicated.
   3. Provide continuous J-channel (or other profile, as appropriate) trim at all corners, penetrations, and panel perimeters where metal panels meet dissimilar finishes.

3.08 FIELD QUALITY CONTROL

A. Special Inspector: Owner will engage a qualified special inspector 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 "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
   2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1.

3.09 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

B. Touchup Painting: After erection, promptly clean, prepare, and prime or re-prime 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 or SSPC SP-3.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION

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SECTION 21 05 00

FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler systems.

B. The Fire Protection System is a complete design / build system and all systems, equipment, piping, etc are to be provided under the contract for a complete functional system that passes all codes and local inspections.

1.02 RELATED REQUIREMENTS

A. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers; 2005.

C. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

D. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

E. ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings; The American Society of Mechanical Engineers; 2007.

F. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

G. ASTM A 795/A 795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2008.

H. AWWA C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids; American Water Works Association; 2008.

I. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2007 (ANSI/AWWA C111/A21.11).

J. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Project Record Documents: Record actual locations of components and tag numbering.

PART 2 PRODUCTS

2.01 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform work to NFPA 13.

B. Welding Materials and Procedures: Conform to ASME Code.

2.02 BURIED PIPING

A. Steel Pipe: ASTM A 53/A 53M Schedule 40 or ASTM A 795 Standard Weight, black.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded; with double layer, half-lapped polyethylene tape.

2.03 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A 795 Schedule 10 or ASTM A 53 Schedule 40, black.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded fittings.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

B. Cast Iron Pipe: AWWA C151/A21.51.
   1. Fittings: AWWA C110/A21.10, standard thickness.
   2. Joints: AWWA C111, rubber gasket.
   3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.04 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

H. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.05 GATE VALVES

A. Up to and including 2 inches (50 mm):
   1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2 inches (50 mm):
   1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid rubber covered bronze or cast iron wedge, flanged ends.

C. Over 4 inches (100 mm):
   1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2.06 GLOBE OR ANGLE VALVES

A. Up to and including 2 inches (50 mm):
   1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.

2.07 BALL VALVES

A. Up to and including 2 inches (50 mm):
   1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union.

B. Over 2 inches (50 mm):
   1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches (250 mm) and over, flanged.

2.08 BUTTERFLY VALVES

A. Bronze Body:
   1. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.

2.09 DRAIN VALVES

A. Compression Stop:
   1. Bronze with hose thread nipple and cap.

B. Ball Valve:
   1. Brass with cap and chain, 3/4 inch (20 mm) hose thread.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Install standpipe piping, hangers, and supports in accordance with NFPA 14.

C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

D. Install piping to conserve building space, to not interfere with use of space and other work.

E. Group piping whenever practical at common elevations.

F. Sleeve pipes passing through partitions, walls, and floors.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.

2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09 90 00.

K. Do not penetrate building structural members unless indicated.

L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

M. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

N. Provide drain valves at main shut-off valves, low points of piping and apparatus.

END OF SECTION

SECTION 21 13 00

FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system..

B. System design, installation, and certification.

C. Fire department connection.

1.02 REFERENCE STANDARDS

A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2007.

C. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
   3. Submit shop drawings to authority having jurisdiction for approval. Submit proof of approval to Engineer.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
   2. Sprinkler Wrenches: For each sprinkler type.

1.04 QUALITY ASSURANCE

A. The Fire Protection System is a complete design / build system and all systems, equipment, piping, etc are to be provided under the contract for a complete functional system that passes all codes and OFS inspections.

B. Conform to UL requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

D. Equipment and Components: Provide products that bear UL label or marking.

E. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 SPRINKLER SYSTEM

A. Sprinkler System: Provide system for coverage of entire building.

B. Occupancy: light hazard, ordinary hazard group 1.

C. Water Supply: Municipal Water 4” service.

2.02 SPRINKLERS

A. Suspended Ceiling Type: Recessed pendant type with matching push on escutcheon plate.
   1. Finish: Chrome plated.
   2. Escutcheon Plate Finish: Chrome plated.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Standard upright type with guard.
   1. Finish: Brass.
   2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Sidewall Type: Standard horizontal sidewall type with matching push on escutcheon plate and guard.
   1. Finish: Chrome plated.
   2. Escutcheon Plate Finish: Chrome plated.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Guards: Finish to match sprinkler finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

D. Place pipe runs to minimize obstruction to other work.

E. Place piping in concealed spaces above finished ceilings.

F. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

G. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

H. Flush entire piping system of foreign matter.

I. Install guards on sprinklers where indicated.

J. Hydrostatically test entire system.

K. Require test be witnessed by Fire Marshal.

3.02 SCHEDULES

A. System Hazard Areas:
   1. Administration Areas: Light Hazard.
   2. Equipment Storage and Mechanical Rooms: Ordinary Hazard, Group 1.

END OF SECTION

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.

F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

A. Manufacturers:
   1. Knauf Insulation; _____: www.knaufusa.com.
   2. Johns Manville Corporation; Model _____: www.jm.com.
   3. Owens Corning Corp; Model _____: www.owenscorning.com.
   4. CertainTeed Corporation; _____: www.certainteed.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 850 degrees F (454 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).

D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Armacell LLC; AP Armaflex: www.armacell.us/#sle.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 220 degrees F (104 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      a. Johns Manville Corporation; _____: www.jm.com/#sle.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil (0.25 mm).
      e. Connections: Brush on welding adhesive.
   3. Covering Adhesive Mastic: Compatible with insulation.
      a. Compatible with insulation.

B. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
   1. Lagging Adhesive: Compatible with insulation.
      a. Compatible with insulation.

C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
   1. Thickness: 0.016 inch (0.40 mm) sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
   4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1 inch.
   2. Domestic Cold Water:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1/2 inch.
   3. Condensate Piping:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1/2 inch.
   4. Supplies & Traps at Barrier Free Lavatories:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1/2 inch.

END OF SECTION

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Gas.
   4. Pipe hangers and supports.
   5. Valves.

1.02 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

E. ASME B31.1 - Power Piping; 2014.

F. ASME B31.9 - Building Services Piping; 2014.

G. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2015.

H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

I. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.

J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

K. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.

O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).

P. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 2012.

Q. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter; 2003.

R. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2013.

S. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2014.

T. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.

U. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2002 (Reapproved 2009).

V. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.

W. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2014.

X. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

Y. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

Z. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

AA. AWWA C651 - Disinfecting Water Mains; 2005.

AB. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

AC. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

AD. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.

AE. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

AF. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.

AG. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

AH. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.03 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.04 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of Michigan plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

A. PVC Pipe: ASTM D2665.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

2.05 NATURAL GAS PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

A. Polyethylene Pipe: ASTM D2513, SDR 11.
   1. Fittings: ASTM D2683 or ASTM D2513 socket type.
   2. Joints: Fusion welded.

2.06 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type.
   2. Joints: ASME B31.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

2.07 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.08 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

2.09 BALL VALVES

A. Manufacturers:
   1. Conbraco Industries, Inc: www.apollovalves.com.
   2. Grinnell Products; _____: www.grinnell.com/#sle.
   3. Nibco, Inc: www.nibco.com.
   4. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder, threaded, or grooved ends.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 05 23.

H. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

I. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

J. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Provide copper plated hangers and supports for copper piping.

3.04 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.05 TOLERANCES

A. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 33 01 10.58.

B. Prior to starting work, verify system is complete, flushed and clean.

C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 14 inch wg (. kPa). Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

3.08 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
         1) Maximum Hanger Spacing: 6.5 ft (2 m).
         2) Hanger Rod Diameter: 3/8 inches (9 mm).
      b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).
      c. Pipe Size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 1/2 inch (13 mm).
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft (1.8 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION

SECTION 22 10 06
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Washing machine boxes and valves.

E. Refrigerator valve and recessed box.

F. Water hammer arrestors.

1.02 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; 2001 (R2007).

B. ASSE 1011 - Hose Connection Vacuum Breakers; 2004.

C. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011.

D. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

E. NSF 372 - Drinking Water System Components - Lead Content; 2011.

F. PDI-WH 201 - Water Hammer Arresters; 2010.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Floor Drain :
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.03 CLEANOUTS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   2. Josam Company: www.josam.com.
   3. Zurn Industries, LLC: www.zurn.com.

B. Cleanouts at Exterior Unsurfaced Areas (CO-2):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

C. Cleanouts at Interior Finished Floor Areas (CO-3):
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

D. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 HOSE BIBBS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   2. Watts Regulator Company: www.wattsregulator.com.
   3. Zurn Industries, LLC: www.zurn.com.

B. Interior Hose Bibbs:
   1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

2.05 WASHING MACHINE BOXES AND VALVES

A. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch (50 mm) waste, slip in finishing cover.

2.06 REFRIGERATOR VALVE AND RECESSED BOX

A. Description: Plastic preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

2.07 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
   3. Zurn Industries, LLC: www.zurn.com.

B. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.

H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch (20 mm) minimum, and minimum 18 inches (450 mm) long.

END OF SECTION

SECTION 22 15 00
GENERAL-SERVICE COMPRESSED-AIR SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and pipe fittings.

B. Air compressor.

C. Air receiver and accessories.

PART 2 PRODUCTS

2.01 PIPE AND PIPE FITTINGS

A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.02 VALVES

A. Air Outlets:
   1. Quick Connector: 3/8 inch (10 mm) brass, snap on connector with self closing valve, Style A.

2.03 UNIONS AND COUPLINGS

A. Unions:
   1. Ferrous Pipe: 150 psi (1034 kPa) malleable iron threaded unions.

B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.04 COMPRESSOR

A. Compressor by Owner:

2.05 AIR RECEIVER

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Make air cock and drain connection on horizontal casing.

C. Install line size gate valve and check valve on compressor discharge. Refer to Section 22 05 23.

D. Connect condensate drains to nearest floor drain.

E. Install takeoffs to outlets from top of main, with shut off valve after takeoff. Slope takeoff piping to outlets.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.1.

C. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.

D. Cap and seal ends of piping when not connected to mechanical equipment.

END OF SECTION

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water heaters.

1.02 SUBMITTALS

A. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

B. Shop Drawings:
   1. Indicate heat exchanger dimensions, size of tappings, and performance data.
   2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three year of documented experience.

1.04 CERTIFICATIONS

A. Water Heaters: NSF approved.

B. Gas Water Heaters: Certified by CSA International to 1 or 2, as applicable, in addition to requirements specified elsewhere.

C. Electric Water Heaters: UL listed and labeled to UL 174 or UL 1453.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 RESIDENTIAL GAS FIRED WATER HEATERS

A. Type: Automatic, natural gas-fired, vertical storage.

B. Tank: Glass lined welded steel with single flue passage, flue baffle and draft hood; thermally insulated and encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

C. Controls: Automatic water thermostat and built-in gas pressure regulator; temperature range adjustable from 120 to 170 degrees F (49 to 77 degrees C), cast iron or sheet metal burner, safety pilot and thermocouple.

D. Accessories: Provide:
   1. Water Connections: Brass.
   2. Dip Tube: Brass.
   3. Drain Valve.
   4. Anode: Magnesium.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Service sinks.

F. Electric water coolers.

G. Showers.

H. Eye and face wash fountains.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2009.

D. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008.

E. ARI 1010 - Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers; Air-Conditioning and Refrigeration Institute; 2002.

F. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2002).

G. ASME A112.18.1 - Plumbing Supply Fittings; 2012.

H. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013.

I. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); 2008 (R2013).

J. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2011.

K. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2004.

L. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

M. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Exposed Flush Valve:
   1. ASME A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker; maximum 1.6 gallon (6 L) flush volume.

B. Seats:
   1. Manufacturers:
      a. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
      b. Bemis Manufacturing Company; _____: www.bemismfg.com/#sle.
      c. Church Seat Company; _____: www.churchseats.com/#sle.
      d. Olsonite; _____: www.olsonite.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Solid black plastic, open front, extended back, self-sustaining hinge, brass bolts, with cover.

2.03 TANK TYPE WATER CLOSETS

A. Tank Type Water Closet Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Gerber Plumbing Fixtures LLC; _____: www.gerberonline.com/#sle.
   3. Eljer, Inc; Model _____: www.eljer.com.
   4. Kohler Company; _____: www.kohler.com/#sle.
   5. Zurn Industries, Inc; _____: www.zurn.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Bowl: ASME A112.19.2; floor mounted, siphon jet, vitreous china, 16.5 inches (420 mm) high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
   1. Water Consumption: Maximum 1.6 gallons (6 liters) per flush.

C. Seat Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Bemis Manufacturing Company; _____: www.bemismfg.com/#sle.
   3. Church Seat Company; _____: www.churchseats.com/#sle.
   4. Olsonite; _____: www.olsonite.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

D. Seat: Solid white plastic, open front, extended back, less cover, complete with self-sustaining hinge.

2.04 WALL HUNG URINALS

A. Wall Hung Urinal Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Eljer, Inc: www.eljer.com.
   3. Kohler Company; _____: www.kohler.com/#sle.
   4. Zurn Industries, Inc; EcoVantage Z5798 High-Efficiency Urinal System: www.zurn.com/#sle.

B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
   1. Flush Volume: 1.0 gallons (3.7 liters), maximum.
   2. Flush Valve: Exposed (top spud).
   3. Flush Operation: Sensor operated.
   4. Trap: Integral.

C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
   1. Sensor-Operated Type: Solenoind or motor-driven operator, low voltage hard-wired, infrared sensor with mechanical over-ride or over-ride push button.
   2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.

D. Carriers:
   1. Manufacturers:
      a. JOSAM Company; _____: www.josam.com/#sle.
      b. Sloan Valve Company: www.sloanvalve.com.
      c. Zurn Industries, Inc; _____: www.zurn.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.05 LAVATORIES

A. Lavatory Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Eljer, Inc: www.eljer.com.
   3. Kohler Company; _____: www.kohler.com/#sle.
   4. Zurn Industries, Inc; _____: www.zurn.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, ___ by ___ inch (___ by ___ mm) minimum, with 4 inch (100 mm) high back, rectangular basin with splash lip, front overflow, and soap depression.
   1. Drilling Centers: 4 inch (100 mm).

C. Supply Faucet Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Kohler Company; _____: www.kohler.com/#sle.
   3. Zurn Industries, Inc; _____: www.zurn.com/#sle.
   4. Hansgrohe.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

D. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 2.2 gallons per minute (8.3 liters per minute), indexed handles.

E. Accessories:
   1. Chrome plated 17 gage, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug and arm with escutcheon.
   2. Rigid supplies.

2.06 SINKS

A. Sink Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Eljer, Inc: www.eljer.com.
   3. Kohler Company; _____: www.kohler.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Single Compartment Bowl: ASME A112.19.3; _____ by _____ by _____ inch (_____ by _____ by _____ mm) outside dimensions 20 gage, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
   1. Drain: 1-1/2 inch (38 mm) chromed brass drain.

C. Double Compartment Bowl: ASME A112.19.3; _____ by _____ by _____ inch (_____ by _____ by _____ mm) outside dimensions 20 gage, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
   1. Drain: 1-1/2 inch (38 mm) chromed brass drain.

2.07 SHOWERS

A. Shower Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Kohler Company; _____: www.kohler.com/#sle.
   3. Hansgrone
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Trim: ASME A112.18.1; concealed shower supply with pressure balanced mixing valves, integral service stops, bent shower arm with adjustable spray ball joint shower head with maximum flow, and escutcheon.

2.08 ELECTRIC WATER COOLERS

A. Electric Water Cooler Manufacturers:
   1. Elkay Manufacturing Company; _____: www.elkay.com/#sle.
   2. Haws Corporation; _____: www.hawsco.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fountain:
   1. Water Cooler: Electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   2. Capacity: 8 gallons per hour (30.3 liters per hour) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
   3. Electrical: 115 V, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.
      a. Capacity: 8 gallons per minute (30.3 liters per minute) of 50 degree F (10 degree C) water with inlet at 80 degree F (27 degree C) and room temperature of 90 degree F (32 degree C), when tested in accordance with ASHRAE Std 18.

2.09 SERVICE SINKS

A. Service Sink Manufacturers:
   1. Fiat :
   2. Proflo:
   3. Mustee_____.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Bowl: 36 by 24 by 10 inch (900 by 600 by 250 mm) high white molded stone, floor mounted, with one inch (25 mm) wide shoulders, vinyl bumper guard, stainless steel strainer.

C. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

D. Trim:

E. Accessories:
   1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
   2. Hose clamp hanger.
   3. Mop hanger.

2.10 EMERGENCY EYE AND FACE WASH

A. Emergency Wash Manufacturers:
   1. Haws Corporation; _____: www.hawsco.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Emergency Wash: ANSI Z358.1; wall-mounted, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads and face spray ring, stainless steel dust cover, copper alloy control valve and fittings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.

3.04 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 CLEANING

A. Clean plumbing fixtures and equipment.

3.06 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

3.07 SCHEDULES

A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
   1. Water Closet:
      a. Standard: 15 inches (380 mm) to top of bowl rim.
      b. Accessible: 18 inches (455 mm) to top of seat.
   2. Water Closet Flush Valves:
      a. Standard: 11 inches (280 mm) min. above bowl rim.

3. Urinal:
    a. Standard: 22 inches (560 mm) to top of bowl rim.
    b. Accessible: 17 inches (430 mm) to top of bowl rim.
4. Lavatory:
    a. Accessible: 34 inches (865 mm) to top of basin rim.
5. Electric Water Cooler:
    a. Standard Adult: 40 inches (1015 mm) to top of basin rim.
    b. Accessible: 36 inches (915 mm) to top of spout.
6. Shower Heads:
    a. Adult Male: 69.5 inches (1765 mm) to bottom of head.
    b. Adult Female: 64.5 inches (1640 mm) to bottom of head.
7. Emergency Eye and Face Wash:
    a. Standard: 38 inches (965 mm) to receptor rim.

B. Fixture Rough-In
1. Water Closet (Flush Valve Type):
    a. Cold Water: 1 Inch (25 mm).
    b. Waste: 4 Inch (100 mm).
2. Water Closet (Tank Type):
    a. Cold Water: 1/2 Inch (15 mm).
    b. Waste: 4 Inch (100 mm).
3. Urinal (Flush Valve Type):
    a. Cold Water: 3/4 Inch (20 mm).
    b. Waste: 2 Inch (50 mm).
    c. Vent: 1-1/2 Inch (40 mm).
4. Lavatory:
    a. Hot Water: 1/2 Inch (15 mm).
    b. Cold Water: 1/2 Inch (15 mm).
    c. Waste: 1-1/2 Inch (40 mm).
    d. Vent: 1-1/4 Inch (32 mm).
5. Sink:
    a. Hot Water: 1/2 Inch (15 mm).
    b. Cold Water: 1/2 Inch (15 mm).
    c. Waste: 1-1/2 Inch (40 mm).
6. Service Sink:
    a. Hot Water: 1/2 Inch (15 mm).
    b. Cold Water: 1/2 Inch (15 mm).
7. Service Sink:
    a. Hot Water: 1/2 Inch (15 mm).
    b. Cold Water: 1/2 Inch (15 mm).
    c. Waste: 3 Inch (80 mm).
8. Electric Water Cooler:
    a. Cold Water: 1/2 Inch (15 mm).
    b. Waste: 1-1/4 Inch (32 mm).
9. Shower:
    a. Hot Water: 1/2 Inch (15 mm).
    b. Cold Water: 1/2 Inch (15 mm).

END OF SECTION

SECTION 23 00 00
MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This Division includes all materials, labor, equipment, tools, supervision, permits, and incidentals necessary to complete installation and successfully test, start-up, and operate, in a practical and efficient manner, all mechanical systems indicated on the Mechanical Drawings and described in this Division. The work shall also include any items which, while not specifically included in the Contract Documents, are reasonable and are accepted trade practices or necessary for the proper completion of the systems.

B. Mechanical systems in the contract shall include the following:
   1. Plumbing systems including:
      a. Domestic potable hot water, cold water, and sanitary drain sytems.
      b. Plumbing fixtures, piping, and insulation indicated in the Drawings and Specifications.
   2. Heating, ventilation, and air-conditioning (HVAC) systems including all equipment ductwork, piping, insulation, and temperature control systems indicated in the Drawings and the Specifications.

C. The General Provisions of this Contract, including General and Supplementary Conditions and other General Requirements specified in the Architectural, Electrical, Structural, and Fire Protection Specifications apply to the work specified in this Section.

D. This section is not intended to supersede, but to clarify the definitions in Division 01, General Requirements.

1.02 DRAWINGS AND SPECIFICATIONS

A. Drawings are diagrammatic and are intended to convey a general arrangement and scope of the work included in the contract. Should drawings contradict themselves or the Specifications, the better quality or greater quantity of work shall be included.

B. The Mechanical Contractor shall be familiar with all Architectural, Structural, Fire Protection, and Electrical Drawings and Specification Sections, and shall follow any special requirements or directions included in these areas.

C. Drawings and Specifications are intended to include all work and materials necessary for completion of the work. Any incidental item of material, labor or detail required for the proper execution and completion of the work and omitted from either the drawings and specifications or both, but required by governing codes local regulations, trade practices, operational functions, and good workmanship, shall be provided as part of the Contract Work without extra charge, even though not specifically detailed or specified.

D. Should there be any question as to the scope of work for which the Mechanical Contractor is responsible, they should request an interpretation before submitting their bid. After contracts are awarded, the Owner shall not be responsible for claims for extras for work that was not included because the Mechanical Contractor was unsure if they should include given work in their bid.

1.03 SITE AND PROJECT DOCUMENT EXAMINATION

A. Submission of a bid proposal is considered evidence that the Mechanical Contractor has completed the following:
   1. Visited the site.
   2. Informed themselves of the site conditions.
   3. Examined Drawings and Specifications of all trades including Architectural, Structural and Electrical, and is proficient, experienced and knowledgeable of all standards, codes, ordinances, permits and regulations which affect his respective trade, and that all costs are included in his proposal.

B. The Mechanical Contractor and/or Sub-Contractor shall insure all required permits, and assessments have been obtained prior to any work beginning. Contractor shall verify requirement to include privilege fees, plan review fees, and permits as part of his formal bid.

C. Field Changes:
   1. This Mechanical Contractor shall not make any field changes that affect the system design, equipment manufacturer, timing, costs, or performance without written approval from the Mechanical and Plumbing Engineer. Approval shall be in the form of a written Field Change Request or Change Order, or supplemental memorandum addressed to the Engineer. All Change Orders shall be directed through the General Contractor and Architect.
   2. The Contractor assumes liability for any additional costs for changes requested. Should any unauthorized change be determined by the Engineer and Architect as lessening the value of the project, a credit will be request, and shall be issued as a change to the contract.

1.04 STANDARDS, CODES, AND PERMITS

A. Refer to Division 01, General Requirements and Supplementary Conditions.

B. All work shall comply with the latest edition of applicable standards and codes of following:
   1. ASA - American Standards Association
   2. ASME - American Society of Mechanical Engineers
   3. ASTM - American Society of Testing Materials
   4. ANSI - American National Standards Institute
   5. AGA - American Gas Association
   6. ASHRAE - American Society of Heating, Refrigerating, and Air Conditioning Engineers
   7. AWWA - American Water Works Association
   8. NFPA - National Fire Protection Association
   9. IBR - Institute of Boiler and Radiator Manufacturers
   10. AWS - American Welding Society
   11. UL - Underwriter's Laboratories
   12. NEMA - National Electric Manufacturers Association
   13. NEC - National Electric Code
   14. ARA - American Refrigeration Association
   15. OSHA - Occupational Safety and Health Act
   16. ABMA - American Boiler Manufacturers Association
   17. International Mechanical Code 2012
   18. International Plumbing Code 2012 (with Michigan Ammendments)
   19. Michigan Mechanical Code 2012

C. All work shall be provided and tested in accordance with all applicable local county, state laws, ordinances, codes, rules and regulations.

D. No work shall be covered or enclosed by walls, ceilings, or other, until the work is tested in accordance with applicable codes and regulations, and successful tests witnessed and approved by authorized inspection authority. Written approvals shall be secured by the Mechanical Contractor and submitted to Engineer before final acceptance of work will be granted.

1.05 SUBMITTALS

A. Proposal Supplement:
   1. Contractor to submit ONE (1) copy of Proposal Supplement - SECTION 23 00 10 - MECHANICAL EQUIPMENT AND MATERIALS, at the time of Bid opening, listing the manufacturers upon which his bid was based, including all items being provided by Sub-Contractors.
   2. After Proposal Supplement and Sub-Contractors are approved, no deviation shall be permitted without written approval of Engineer.

B. Shop Drawings:
   1. Submit a minimum of EIGHT (8) copies of shop drawings on all equipment and materials indicated on the Drawings for approval, prior to placing delivery orders (also refer to Architectural Specifications for shop drawing requirements).
   2. At the time of submittal for review by the Engineer, shop drawings shall include signatures or stamps indicating that the Contractor and/or the Sub-Contractor has reviewed the submittals and has coordinated the required space, quantities required, services and work of other trades for the equipment or system being submitted.
   3. Submittals shall be in the form of bound folders with the name of the Project, Architect, Engineer and the submitting Contractor indicated on the cover. Submittals requiring drawings too large to be bound into the folder shall be folded and inserted in pockets bound into the folder.
   4. Provide shop drawings of all manufactured equipment and materials except pipe, pipe fittings and galvanized ductwork. Drawings shall include equipment capacities, weights, dimensions, construction details, installation, controls, wiring diagrams, and motor data.
   5. Engineer's approval of shop drawings is for general application only and is a service only and not considered as a guarantee of total compliance with or as relieving the Mechanical Contractor of basic responsibilities under all contract documents, and does not approve changes in time or cost.
   6. After approval, the Mechanical Contractor and it's subcontractors are responsible to provide information to all other trades involved in, or affected by, the installation of the Mechanical and Plumbing equipment.

C. Record (As-Built) Drawings:
   1. At substantial completion of construction, furnish record (as-built) plans to the Engineer for approval. As part of the Final Punch List/Close-out, approved as-built plans shall be provided to the Owner.
   2. Record drawings shall include, at the minimum:
      a. The location and performance data on each piece of equipment.
      b. The general configuration of duct and pipe distribution systems, including sizes.
      c. The terminal air or water design flow rates.

D. Operating and Maintenance Manuals:
   1. The Mechanical Contractor and subcontractors shall provide TWO (2) bound and indexed (with tabs for each section) sets of operating and maintenance instructions to the Engineer for review as part of the Final Punch List/Close-out. The Engineer will provide approved manuals to the Owner.
   2. These manuals shall be in accordance with industry-accepted standards and shall include, at the minimum:
      a. Submittal data stating equipment size and selected options for each piece of equipment requiring maintnance.
      b. Operation and Maintenance manuals for each piece of equipment requiring maintenance. Required routine maintenance actions shall be clearly identified.
      c. Names and addresses of at least one (1) service agency.
      d. HVAC controls system maintenance and calibration information, including:
         1) Wiring diagrams
         2) Control schematics
         3) Control sequence of operation descriptions
      e. HVAC control drawings with desired or field-determined set points permenantly recorded and indicated.
      f. A complete narrative of how each system is intended to operate, including suggested set points.

1.06 MECHANICAL UTILITY SERVICE REQUIREMENTS

A. Exterior plumbing services including sanitary drain and storm drain systems beyond 5 feet from the building are covered within the scope of the Civil Engineer on this project.

B. Natural Gas Service
   1. The Mechanical Contractor shall arrange with the Utility Company to provide gas service and a gas meter to the location shown on the Mechanical Drawings, complete with a shut-off valve at the meter.
   2. The Mechanical Contractor shall consult with the Utility Company as to the extent of its work.
   3. Any costs from the Utility Company associated with bringing natural gas services to the site shall be paid for by the Mechanical Contractor.

PART II PRODUCTS

2.01 STANDARDS

A. All products shall be furnished by established manufacturers regularly engaged in making the type of materials to be provided and complete with all parts, accessories, connections, etc. as specified or as recommended and/or required by the manufacturer.

B. All material where applicable shall be labeled or listed by Underwriters Laboratories, Inc.

C. All materials and equipment shall be installed in strict compliance with manufacturer's installation instructions. Where special installations or deviations are required, written approval from the manufacturer is required, and shall not void the manufacturer warranty.

2.02 SUBSTITUTIONS AND CHANGES

A. The Contractor and/or Equipment Supplier may propose alternate equipment or materials of EQUAL or better quality, function, performance, durability and appearance. This information is to be submitted to the Engineer's Office TEN (10) working days prior to bid due date to allow for proper review time and to issue an addendum incorporating the acceptable substitution(s). It is the submitter's responsibility to provide sufficient material for review as required by Engineer's Office. Acceptance and approval is the responsibility of the Engineer.

B. The Contractor and/or Equipment Supplier is liable for any added costs to himself or others and is responsible for verifying dimensions, clearance and roughing-in requirements, when product not named as the basis of design are used and is responsible for advising other Contractors of variations and submit revised drawing layout for approval of Engineer.

C. See SECTION 23 00 10 for voluntary alternates.
   1. No substitutions will be accepted after bids are received.
   2. When only one manufacturer is listed within the description of the mechanical equipment, the design engineering or project requirements will not allow substitution of other manufacturers.
   3. Contractor will be responsible for ALL costs (engineering time, manufacturer's costs, distributor costs, etc.) incurred to replace equipment not approved if substitutions are made by the distributor, manufacturer's rep., contractor or subcontractor.

D. Equipment not listed in the Mechanical Schedules or this Division 23, or not approved in writing by the Engineer, shall be separated from the Base Bid and shall be listed as a Voluntary Alternate only. Before acceptance, all Voluntary Alternates must be approved by the Engineer and Architect, and must be approved for use by any special Specifications related to the job.

E. The Mechanical Contractor is responsible and liable for any added costs to themselves or others that may be a result from use of Approved Alternates or Voluntary Alternates.

F. The Mechanical Contractor is responsible for bidding the Mechanical and Plumbing materials such as pipe and ductwork materials as listed on the Mechanical Drawings and this Division 23 Specification. Alternate materials or value engineering must be pre-approved by the Engineer, prior to bid submittal. Approval of alternate materials must be shared with the Architect, Owner, and other bidders.

2.03 ELECTRICAL REQUIREMENTS AND CONNECTIONS

A. General:
   1. When the Mechanical equipment not named as the basis of design is approved for use, the Mechanical Contractor is responsible for any costs incurred by other trades, including

revisions to the Electrical requirements such as conduit, wire, starters, heaters, fused switches, disconnects, or circuit breakers.

2. Electrical items furnished shall bear the Underwriter's Laboratories label and the installation shall comply with requirements of the National Electric Code, ANSI, IPCEA, IRI, and local codes, ordinances and regulations.

B. Motor Starters and Controls:
   1. The Electrical Contractor shall provide all manual or magnetic motor starters as required for all motors as indicated on all Electrical Drawings.
   2. The Mechanical Contractor shall provide factory installed motor starters integral with packaged equipment containing thermal overcurrent protection in all underground conductors with heater coils selected for specific motor usage for all motors.

C. Electrical Wiring and Controls:
   1. The Mechanical Contractor shall furnish and install all motors, drives, controllers integral to equipment and factory mounted controls for all mechanical equipment.
   2. The Mechanical Contractor or Temperature Ccontrol Contractor shall furnish and install all electrical devices requiring mechanical connections, and/or electrical connections, such as thermostats, UL rated temperature control cabinets, etc., as listed in the Division 23 Contract Documents.
   3. The Temperature Control Contractor or Mechanical Contractor shall furnish and install all power and Class 2 and 3 wiring (low voltage), conduit, and electrical boxes associated with the Temperature Control System. Verify with Mechanical and Electrical Engineer whether plenum-rated, low voltage wiring is required.
   4. The Electrical Contractor shall install all Class 1 (120 volt and greater) power wiring, conduit to motors and/or factory mounted control panels as indicated on Electrical Drawings or as indicated in Specifications.
   5. All electrical wiring work by the Mechanical Contractor and Temperature Control Contractor shall be in accordance with Division 26 requirements.

PART III EXECUTION

3.01 COORDINATION OF MECHANCIAL WORK

A. Responsibility:
   1. The Mechanical Contractor shall be responsible for all Sub-Contractors and Suppliers, and include in his bid all materials, labor and equipment involved in accordance with all local regulations, jurisdictional awards, decisions, and secure compliance of all parts of the Specifications and Drawings regardless of sectional inclusion in these Specifications.
   2. The Mechanical Contractor and Sub-Contractors shall be responsible for all parts applicable to the job in accordance with the Specifications and Drawings, and shall be responsible for coordinating locations and arrangements of all Mechanical and Plumbing work with all other relevant Architectural, Structural, Electrical, and fire protection Mechanical Drawings, shop drawings, and Specifications.

B. Submission of a bid proposal is considered evidence that the Mechanical Contractor and it's Sub-Contractors are fully capable of providing the following and have included the following in their bid proposal:
   1. Fully proficient and experienced to do the work described in the contract documents.
   2. Knowledgeable of all federal, state, and local standards, codes, ordinances, permits, and regulations that pertain to the work described in the contract documents.
   3. Have properly estimated the time and workforce, including subcontractors, needed to complete the job by the due date.
   4. Have included all material, equipment, and labor costs for completion of the job, including all subcontractors costs.
   5. Have all the equipment, tools, supplies, vehicles, and trailers to complete the job.
   6. Have included all travel, food and lodging expenses.

C. Installation of Mechanical Systems:
   1. Install all Mechanical equipment as shown on the Mechanical Drawings. Deviations of the Mechanical systems and/or installation locations shall be approved by the Engineer.
   2. Changes or deviations of the Mechanical systems design and/or installation locations may require redrawing and resubmittal of the Mechanical Drawings to the state or local Mechanical or building inspector.
   3. Any costs associated with re-drawing and resubmittal of the Mechanical and Plumbing Drawings, that did not have pre-approval from the Mechanical Engineer, may be charged to the Mechanical Contractor or Mechanical subcontractors. All costs shall be based on a time and materials basis.
   4. Minor deviations from the original design will be accepted, but a written request or courtesy call to the Engineer is required. The Engineer may request a written report of the situation and a written request for record.

3.02 EQUIPMENT CLEARANCE

A. The Mechancical Contractor shall coordinate with the Electrical Contractor's equipment location to insure adequate clearance is maintained as required by the National Electrical Code and applicable state and local codes, as well as accessibility for future maintenance and operation.

B. Mechanical work shall be arranged with building construction to provide minimum 6'-8" overhead clearance where possible.

C. Install equipment in a neat and workmanlike manner. Install, align, and level all Mechanical equipment so that it may be easily accessed, adjusted, serviced, and balanced.

D. Install equipment so that filters, valves, and controls may be easily accessed.

E. Install equipment so that it does not block or limit access to other equipment, access panels, etc.

F. Install equipment so that it may be easily inspected.

3.03 GENERAL SUPPORTS

A. Mechanical Contractor shall provide all necessary channel, angle, brackets, vibration isolators, or supplementary steel as required for adequate support for all piping, specialties, ductwork, and equipment which is hung from the ceiling or roof, or mounted to the floor or roof. For equipment requiring welding or bolting to steel framing, or anchoring to concrete structures, the Mechanical Contractor shall require written approval from the Architect and General Contractor.

B. Where piping or equipment is suspended from concrete construction, coordinate with the General Contractor to set approved concrete inserts, that shall receive hanger rods such as UniStrut in the concrete form-work. In metal decks, coordinate with General Contractor to use Ramset or welds as required.

3.04 WALL, FLOOR, CEILING, AND ROOF OPENINGS

A. Locate all openings and advise the General Contractor of details and templates of all openings necessary for inspection of Mechanical work.

B. All openings including sawcuts, cores, and required lintels shall be provided by the General Contractor, and shall be approved by the Architect and Structural Engineer. Size and location are the responsibility of the Mechanical Contractor. Cracks and rough edges left following installation of equipment shall be caulked, fire-caulked if required, or filled by the Mechanical Contractor.

C. Perform or pay for all cutting, fitting, repairing, patching and finishing of work of other sections where it is necessary to disturb such work to permit installation of mechanical work.

D. All roof openings including sawcuts and cores through the roof deck shall be provided by the General Contractor, and shall be approved by the Architect and Structural Engineer. Size and location of the openings are the responsibility of the Mechanical Contractor.

E. All roof curbs, Pate Curbs, or other specialty curbs shall be the responsibility of the Mechanical Contractor. Specialty roof curb flashings or curb-membranes shall be included.

F. All roofing materials including standard flashing, and the installation of roofing systems around the Mechanical equipment shall be the responsibility of the General Contractor.

G. All roof deck supporting materials including angles, joists, etc., shall be the responsibility of the General Contractor, and shall be approved by the Architect and Structural Engineer.

3.05 FIELD CHANGES

A. The Mechanical Contractor shall not make any field changes that affect the system design, equipment manufacturer, timing, costs, or performance without written approval from the Mechanical and Plumbing Engineer. Approval shall be in the form of a written Field Change Request or Change Order, or Supplemental Instruction. All Change Orders shall be directed through the General Contractor and Architect.

B. The Contractor assumes liability for any additional costs for changes requested. Should any unauthorized change be determined by the Engineer and Architect as lessening the value of the project, a credit will be request, and shall be issued as a change to the contract.

3.06 PROJECT CLOSE-OUT

A. Final Acceptance and payment will only be made after final Punch-List completion and receipt at the Engineer's Office of:
   1. Approved Operating and Maintenance Instruction Manuals
   2. Approved Record Drawings (As Builts)
   3. All Guarantees/Warranties
   4. Certificates of Inspection
   5. Written and signed verification that Owner's Training has taken place
   6. Final Test and Balance Report (reference SECTION 23 05 93 for Report requirements)
   7. All extra materials specified to be provided within the Contract Documents

3.07 CERTIFICATES OF INSPECTION

A. Submit to the Engineer's Office evidence that installation has been inspected and approved by local or state mechanical inspector and/or the authority having jurisdiction.

3.08 GUARANTEES AND WARRANTIES

A. All labor, materials and equipment shall be guaranteed by Contractor and/or warranted by Manufacturer for ONE (1) year after acceptance date except where specified longer for special equipment. Contractor shall secure such warranty from all Suppliers (not one year from shipment date) or Contractor to assume warranty.

B. Acceptance date of substantial completion shall be Owner occupancy as determined by Architect/Engineer.

C. Contractor shall make all necessary alterations, repairs, adjustments, replacements during guarantee periods as directed by Architect/Engineer to comply with Drawings and Specifications at no cost to Owner.

D. Repair or replacements made under guarantee bear further ONE (1) year guarantee from date of acceptance of repair or replacement.

E. At the end of a one year period of continuous operation, make a complete inspection of all systems, fixtures, equipment, safety devices and controls to insure equipment is operating properly, and report to Engineer in writing.

3.09 PLACING EQUIPMENT INTO OPERATION

A. Mechanical Contractor shall be responsible for all startup procedures, system checks and balancing associated with his equipment.

B. All equipment shall be installed, tested and operated in accordance with manufacturer's recommendations at normal operating conditions.

C. All permanent mechanical equipment operated during construction periods shall be cleaned and damaged equipment replaced.

3.10 OWNER'S TRAINING

A. The option of video taping any and all training sessions shall be given to the Owner at no additional cost, with the Contractor conducting the video taping and with TWO (2) copies of all tapes being turned over to the Owner for future use.

B. The Mechanical Contractor shall conduct ONE (1) - 4-hour training session(s) on the operation and maintenance of all mechanical equipment. Schedule training with Owner at least 72 hours prior to session(s).

C. Refer to Section 23 09 23 for Temperature Control Owner's Training requirements.

END OF SECTION

SECTION 23 00 10
MECHANICAL EQUIPMENT AND MATERIALS

PART 1 GENERAL

1.01 INSTRUCTION:

A. The Mechanical Contractor is to either copy or remove this specification section from the spec book and complete as follows:
   1. Indicate the specific manufacturer on which the bidder's base bid price is based in the blank space provided.
   2. All equipment is to be bid as specified. Material or equipment from another manufacturer may be bid as a Voluntary Alternate, but the dollar amount must be shown as an "Add" or "Deduct" to the base bid. Provide the name of the alternate manufacturer in the space provided.
   3. Insert the name(s) of each subcontractor used in your bid in the space provided in Part 3.
   4. This form shall be submitted with the bid.

1.02 RELATED DOCUMENTS:

A. The other Contract Documents complement the requirements of this Section. The General Requirements apply to the work of this section.

1.03 DEVIATIONS FROM SPECIFIED MATERIAL:

A. See SECTION 23 00 00, Part 2, Paragraph 2.02 - Substitutions and Changes. Base bid shall be based on manufacturers listed in this specification or on the drawings.

PART 2 PRODUCTS

2.01 THE FOLLOWING IS A LIST OF APPROVED MANUFACTURERS, GROUPED ACCORDING TO TYPES OF MATERIALS OR EQUIPMENT.

A. Furnace(s):
   1. Goodman, Carrier, Lennox, and Rheem
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

B. Domestic Hot Water Heater(s):
   1. Lochinvar, A.O. Smith, and Bradford White
      a. Voluntary alternate _____
      b. Add $_____ Deduct $_____

C. Air Terminal(s):
   1. Titus, Tuttle & Bailey, Krueger, and Price
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

D. Exhaust/Supply Fan(s):
   1. Greenheck, Cook, Acme, PennBarry, and Broan
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

E. Infrared Tube Heaters & Unit Heaters
   1. Solaronics, Reznor, Modine, Trane, or Detroit Radiant Products
      a. Voluntary alternate_____
      b. Add $_____ Deduct $ _____

PART 3 SUB-CONTRACTORS

3.01 INSERT THE NAME OF EACH SUB-CONTRACTOR AND WORK TO BE PERFORMED BELOW:

A. Subcontractor_____
Work Performed_____

B. Subcontractor_____
Work Performed_____

C. Subcontractor_____
Work Performed_____

END OF SECTION

SECTION 23 05 10
PENETRATION FIRESTOPPING FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.03 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

A. Only tested firestop systems shall be used in specific locations as follows:

B. Penetrations for the passage of duct, piping, and other mechanical equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

C. Repetitive plumbing penetrations in fire-rated floor assemblies. Penetrations exist for the installation of tubs, showers, aerators and other plumbing fixtures.

1.04 REFERENCES

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.
   1. UL Fire Resistance Directory:
      a. Firestop Devices (XHJI)
      b. Fire Resistance Ratings (BXRH)
      c. Through-Penetration Firestop Systems (XHEZ)
      d. Fill, Voids, or Cavity Material (XHHW)
      e. Forming Materials (XHKU)

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

E. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops.”

F. ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials.”
   1. International Building Code (IBC 2009)
   2. NFPA 101 - Life Safety Code

1.05 QUALITY ASSURANCE

A. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

B. Firestop System installation must meet requirements of ASTM E 814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
   1. Do not use damaged or expired materials.

1.07 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling
   1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
   2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.01 FIRESTOPPING - GENERAL

A. 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 the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
   1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

D. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
   1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
   2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

E. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

F. Mold Resistance: Provide penetration firestoppping with mold and mildew resistance rating of 0 as determined by ASTM G21.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:
   1. Hilti, Inc., Tulsa, Oklahoma
      a. 800-879-8000
      b. www.us.hilti.com
      c. Provide products from the above acceptable manufacturer; no substitutions will be accepted.

2.03 MATERIALS

A. Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Pre-installed firestop devices for use with noncombustible and combustible pipes (closed and open systems) penetrating concrete floors and/or gypsum walls, the following products are acceptable:
   1. Hilti Cast-In Place Firestop Device (CP 680-P) for use with combustible penetrants.
   2. Hilti Cast-In Place Firestop Device (CP 680-M) for use with noncombustible penetrants.
   3. Hilti Speed Sleeve (CP 653) for use with cable penetrations.
   4. Hilti Firestop Drop-In Device (CFS-DID) for use with noncombustible and combustible penetrants.
   5. Hilti Firestop Block (CFS-BL)

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
   1. Hilti Intumescent Firestop Sealant (FS-ONE)
   2. Hilti Self-leveling Firestop Sealant (CP 604)
   3. Hilti Fire Foam (CP 620)
   4. Hilti Flexible Firestop Sealant (CP 606)
   5. Hilti Elastomeric Firestop Sealant (CP 601S)

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
   1. Hilti Elastomeric Firestop Sealant (CP 601S)
   2. Hilti Flexible Firestop Sealant (CP 606)
   3. Hilti Intumescent Firestop Sealant (FS-ONE)

E. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
   1. Hilti Intumescent Firestop Sealant (FS-ONE)

F. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti Intumescent Firestop Sealant (FS-ONE)
   2. Hilti Fire Foam (CP 620)
   3. Hilti Elastomeric Firestop Sealant (CP 601S)
   4. Hilti Flexible Firestop Sealant (CP 606)

G. Non-curing, re-penetrable, intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti Firestop Putty Stick (CP 618)
   2. Hilti Firestop Plug (CFS-PL)

H. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

I. Hilti Firestop Collar (CP 643N)
   1. Hilti Firestop Collar (CP 644)
   2. Hilti Wrap Strips (CP 648E/648S)

J. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti Firestop Mortar (CP 637)
   2. Hilti Firestop Block (CFS-BL)
   3. Hilti Fire Foam (CP 620)
   4. Hilti Firestop Board (CP 675T)

K. Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti Firestop Block (CFS-BL)
   2. Hilti Firestop Board (CP 675T)

L. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
   1. Hilti Firestop Block (CFS-BL)
   2. Hilti Firestop Plug (CFS-PL)

M. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E 814 which is equal to the time rating of construction being penetrated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Verify penetrations are properly sized and in suitable condition for application of materials.
   2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
   3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
   4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
   5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.03 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.
   1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
   2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
   3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION

SECTION 23 05 53
MECHANICAL IDENTIFICATION FOR PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Furnaces: Nameplates.

B. Condensing Unit: Nameplates.

C. Piping: Pipe markers.

D. Thermostats: Nameplates.

E. Gas Monitoring System: Nameplates.

2.02 NAMEPLATES

A. Manufacturers:
   1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
   2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
   3. Seton Identification Products: www.seton.com.
   4. Letter Color: White.
   5. Letter Height: 1/4 inch (6 mm).
   6. Background Color: Black.
   7. Plastic: Comply with ASTM D709.

2.03 PIPE MARKERS

A. Manufacturers:
   1. Brady Corporation: www.bradycorp.com.
   2. Brimar Industries, Inc.: www.pipemarker.com.
   3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
   4. MIFAB, Inc.: www.mifab.com.
   5. Seton Identification Products: www.seton.com.

B. Color: Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. AABC MN-1 - AABC National Standards for Total System Balance; 2002.

C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

D. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; 2005, Seventh Edition.

E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

A. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
   3. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   6. Units of Measure: Report data in I-P (inch-pound) units only.
   7. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Project Engineer.
      g. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
   3. SMACNA (TAB).
   4. NBC, The National Balancing Council.
   5. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
      d. NBC, The National Balancing Council.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Hydronic systems are flushed, filled, and vented.
   13. Pumps are rotating correctly.
   14. Proper strainer baskets are clean and in place.
   15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

3.06 SCOPE

A. Test, adjust, and balance the following:
   1. Forced Air Furnaces.
   2. Exhaust Fans
   3. Air Inlets and Outlets.

3.07 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer.
   2. Model/Frame.
   3. HP/BHP.
   4. Phase, voltage, amperage; nameplate, actual, no load.
   5. RPM.
   6. Service factor.
   7. Starter size, rating, heater elements.

B. Air Moving Equipment:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Air flow, specified and actual.
   6. Return air flow, specified and actual.
   7. Outside air flow, specified and actual.
   8. Total static pressure (total external), specified and actual.
   9. Sheave Make/Size/Bore.
   10. Fan RPM.

C. Exhaust Fans:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Air flow, specified and actual.
   6. Total static pressure (total external), specified and actual.
   7. Inlet pressure.

D. Air Inlets and Outlets Tests:
   1. Air terminal number.
   2. Room number/location.

3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

C. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2014.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experienceand approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Knauf Insulation: www.knaufinsulation.com.
   2. Johns Manville: www.jm.com.
   3. Owens Corning Corporation: www.ocbuildingspec.com.
   4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 250 degrees F (121 degrees C).
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Secure with pressure sensitive tape.

2.03 DUCT LINER

A. Manufacturers:
   1. Knauf Insulation: www.knaufinsulation.com.
   2. Johns Manville: www.jm.com.
   3. Owens Corning Corporation: www.ocbuildingspec.com.
   4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: Incombustible glass fiber complying with ASTM C1071; flexible blanket; impregnated surface and edges coated with acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21.
   1. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F (0.045 at 24 degrees C).
   2. Service Temperature: Up to 250 degrees F (121 degrees C).
   3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm (25.4 m/s), minimum.
   4. Minimum Noise Reduction Coefficients:
      a. 1/2 inch (13 mm) Thickness: 0.30.
      b. 1 inch (25 mm) Thickness: 0.45.
      c. 1-1/2 inches (40 mm) Thickness: 0.60.
      d. 2 inch (50 mm) Thickness: 0.70.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

D. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Duct Liner Application:
   1. Adhere insulation with adhesive for 90 percent coverage.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
   3. Seal and smooth joints. Seal and coat transverse joints.
   4. Seal liner surface penetrations with adhesive.
   5. Duct dimensions indicated are net inside dimensions required for air-flow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES (INSULATION SHALL PROVIDE THE FOLLOWING R-VALUES)

A. Outside Air Intake Ducts: R-6 (installed value).

B. Ductwork Located in Attic: R-6 (installed value).

C. Supply Air Duct: Not Required.

D. Return Air Duct: Not Required.

E. Supply and Return Duct within 15 ft of any Fan:
   1. Flexible Glass Fiber Duct Liner Insulation: 1 inch thick
   2. Duct dimensions on plan are interior dimensions.

END OF SECTION

SECTION 23 09 13
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thermostats.

B. Automatic dampers.

C. Damper operators.

D. Miscellaneous accessories.

1.02 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2012.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; 2013.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

1.03 SUBMITTALS

A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

B. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.

C. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 DAMPERS

A. Performance: Test in accordance with AMCA 500-D.

B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage, 0.1046 inch (2.66 mm).

C. Blades: Galvanized steel, maximum blade size 6 inches (150 mm) wide, 48 inches (1200 mm) long, minimum 22 gage, 0.0299 inch (0.76 mm), attached to minimum 1/2 inch (13 mm) shafts with set screws.

D. Jamb Seals: Spring stainless steel.

E. Shaft Bearings: Oil impregnated sintered bronze.

F. Leakage: Less than one percent based on approach velocity of 2000 ft/min (10 m/sec) and 4 inches wg (1.0 kPa).

2.03 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
   1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
   2. Provide one operator for maximum 36 sq ft (3.24 sq m) damper section.

B. Electric Operators:
   1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.04 INPUT/OUTPUT SENSORS

A. Nitrogen Dioxide/ Carbon Monoxide Detectors:
   1. Electronchemical cells, factory calibrated. Sufficient monitors added to encompass full gas detection of respectable zones.
   2. Sensors should relay monitor when NO2 levels exceed 3.0 ppm.
   3. Sensors should relay monitor when CO levels exceed 25.0 ppm.
   4. Monitor should control zone exhaust fans, visual alarms, and dampers. When alarm is triggered, dampers open and the exhaust fans run for a minimum of 30 minutes.
   5. Manufacturers:
      a. Armstrong.
      b. Honeywell.
      c. Toxalert.

2.05 THERMOSTATS

A. Electric Room Thermostats:
   1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
   2. 7-day programmable with ON-OFF-AUTO switch.

B. Room Thermostat Accessories:
   1. Insulating Bases: For thermostats located on exterior walls.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches (1200 mm) above floor. Align with lighting switches. Refer to Section 26 27 26.

C. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

D. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

E. Provide conduit and electrical wiring in accordance with Division 26. All exposed wiring shall be installed in conduit.

3.02 MAINTENANCE

A. Provide service and maintenance of control system for one year from Date of Substantial Completion.

B. Provide complete service of controls systems, including call backs, and submit written report of each service call.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

1.02 RELATED REQUIREMENTS

A. Section 23 07 13 - Duct Insulation: External insulation and duct liner.

B. Section 23 37 00 - Air Outlets and Inlets.

1.03 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

E. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.

F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.04 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

D. Ducts: Galvanized steel, unless otherwise indicated.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.

C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal.

E. T's, bends, and elbows: Construct according to SMACNA (DCS).

F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 MANUFACTURED DUCTWORK AND FITTINGS

A. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
   1. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
   2. Maximum Velocity: 4000 fpm (20.3 m/sec).
   3. Temperature Range: Minus 10 degrees F to 160 degrees F (Minus 23 degrees C to 71 degrees C).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install in accordance with manufacturer's instructions.

C. Flexible Ducts: Connect to metal ducts with adhesive plus sheet metal screws.

D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

E. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

G. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.

H. Connect diffusers or light troffer boots to low pressure ducts with 6 foot maximum length of flexible duct held in place with strap or clamp.

I. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

J. At exterior wall louvers, seal duct to louver frame.

END OF SECTION

SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall exhausters.

B. Cabinet exhaust fans.

C. Ceiling exhaust fans.

1.02 REFERENCE STANDARDS

A. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; http://www.amca.org/certified/search/company.aspx.

B. AMCA 99 - Standards Handbook; 2010.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2007.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

G. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.04 FIELD CONDITIONS

A. Permanent ventilators may not be used for ventilation during construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck:

B. Loren Cook Company:

C. Acme Fans.

D. Penn Barry.

E. Broan

2.02 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.

B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.

D. Fabrication: Comply with AMCA 99.

E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 WALL EXHAUSTERS

A. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch (13 mm) mesh, 0.062 inch (1.6 mm) thick aluminum wire bird screen.

B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

C. Backdraft Damper: Motorized, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

2.04 CABINET EXHAUST FANS

A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing , resilient mounted motor, gravity backdraft damper in discharge.

B. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and interlocked with the lighting controls..

C. Grille: Molded white plastic.

D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers:

B. Rectangular ceiling diffusers.

C. Registers/grilles:
   1. Ceiling-mounted, egg crate exhaust and return register/grilles.

D. Louvers:

E. Roof hoods.

1.02 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.

B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (R2011).

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tuttle & Bailey

B. Krueger:

C. Price Industries: www.price-hvac.com.

D. Titus

E. Ruskin.

F. Pottorff.

G. Greenheck.

H. Safe Air Dowco.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide plaque style diffuser to discharge air in four way pattern.

B. Connections: Round.

C. Frame: Provide inverted T-bar type.

D. Fabrication: Steel with baked enamel finish.

E. Color: As scheduled.

2.03 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch (13 by 13 by 13 mm), 1/2 by 1/2 by 1 inch (13 by 13 by 25 mm), 1 by 1 by 1 inch (25 by 25 by 25 mm), and _____ grid core.

B. Fabrication: Grid core consists of aluminum with baked enamel finish.

C. Color: As scheduled

D. Frame: Channel lay-in frame for suspended grid ceilings.

2.04 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: 35 degrees fixed grilles of 1/2" spacing.

B. Fabrication: Aluminum with factory baked enamel finish.

C. Color: As scheduled.

D. Frame: 1 inch (25 mm) margin with countersunk screw mounting.

2.05 LOUVERS

A. Type: 4 inch (100 mm) deep with blades on 45 degree slope, heavy channel frame, 1/2 inch (13 mm) square mesh screen over exhaust and 1/2 inch (13 mm) square mesh screen over intake.

B. Color: To be selected by Architect from manufacturer's standard range.

C. Fabrication: 12 gage, 0.1046 inch (2.66 mm) thick extruded aluminum, welded assembly, with factory baked enamel finish.

D. Mounting: Furnish with interior flat flange for installation.

2.06 ROOF HOODS

A. Fabricate air inlet or exhaust hoods in accordance with SMACNA (DCS).

B. Fabricate of galvanized steel, minimum 16 gage, 0.0598 inch (1.52 mm) base and 20 gage, 0.0359 inch (0.91 mm) hood, or aluminum, minimum 16 gage, 0.0598 inch (1.52 mm) base and 18 gage, 0.0598 inch (1.21 mm) hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch (13 mm) square mesh for exhaust and 3/4 inch (19 mm) for intake, and factory prime coat finish.

C. Mount unit on minimum 12 inch (300 mm) high curb base with insulation between duct and curb.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

END OF SECTION

SECTION 23 55 33
FUEL-FIRED UNIT HEATERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gas fired unit heaters.

B. Tubular infrared heaters.

C. Room thermostats.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Addenda.

B. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; 2007, Including All Amendments.

C. NFPA 54 - National Fuel Gas Code; 2015.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

E. NFPA 211 - Guide for Smoke and Heat Venting; 2013, Including All Amendments.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.

C. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.04 WARRANTY

A. Provide five year manufacturers warranty for heat exchangers.

PART 2 PRODUCTS

2.01 GAS FIRED UNIT HEATERS

A. Unit Heaters: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories:
   1. Heating: Natural gas fired.
   2. Discharge Louvers: Individually adjustable horizontal and vertical louvers to match cabinet finish.

B. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.

C. Supply Fan: Propeller type with direct drive.

D. Heat Exchanger: Aluminized steel welded construction.

E. Gas Burner:
   1. Atmospheric type with adjustable combustion air supply.
   2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
   3. Electronic pilot ignition, with electric spark igniter.

F. Gas Burner Safety Controls:
   1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
   2. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.

G. Operating Controls:
   1. Room Thermostat: Cycles burner to maintain room temperature setting.

H. Performance:
   1. Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1; seasonal efficiency to ASHRAE Std 103.

2.02 TUBULAR INFRARED HEATERS

A. Infrared Heaters: Tubular type; packaged, partially factory assembled, pre-wired unit consisting of cabinet, burner, heat exchanger, radiant tube, reflector, controls; for natural gas.

B. Heat Exchanger: Aluminized tubular steel combustion chamber with aluminized steel tube with aluminum reflector.

C. Gas Burner:
   1. Gas Burner: Forced draft type with adjustable combustion air supply.
   2. Gas valve provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
   3. Electronic pilot ignition, with electric spark igniter.
   4. Non-corrosive burner air blower with permanently lubricated motor.

D. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.

E. Operating Controls: Low voltage room thermostat cycles burner to maintain room temperature setting.

F. Performance:
   1. Refer to Schedule. Gas heating capacities are sea level ratings.

2.03 ROOM THERMOSTATS

A. Room Thermostat: Adjustable, low voltage, to control heater stages in sequence with delay between stages, and supply fan to maintain temperature setting.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NFPA 90A.

B. Install gas fired units in accordance with NFPA 54 and applicable codes.

C. Provide vent connections in accordance with NFPA 211. Refer to Section 23 51 00.

D. Provide operating controls; refer to Section 23 09 13.

END OF SECTION

SECTION 26 00 00
ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK:

A. Work included in this Division consists of providing all demolition, labor, materials, equipment, tools, supervision, start-up services, Owner's instructions, including all incidental and related items necessary to complete installation, and successfully test, start up and operate building in a practical and efficient manner. Electrical Systems indicated on Drawings and described in each Section of Division 26 Specification and conforming with all Contract Documents.

B. Work not included under this Division:
   1. Low voltage temperature control wiring. Refer to Part 2, Paragraph 2.03 of this Section.
   2. Field painting of equipment, except for repair to damaged factory finishes.

C. The General Provisions of this Contract, including General and Supplementary Conditions and other General Requirements Sections, apply to the Work specified in this Section.

D. This Section is not intended to supersede, but to clarify, the definitions in Division 1, General Requirements and Supplementary Conditions.

1.02 DRAWINGS AND SPECIFICATIONS:

A. Drawings are diagrammatic and indicate general arrangement of systems and work included in Contract, and shall serve only as design drawings, and not as working drawings, for general layout of various equipment and systems.

B. Drawings and Specifications are intended to supplement each other, and all work specified or indicated in either shall be provided. Should drawings disagree in themselves or with Specifications, the better quality or greater quantity of work shall be provided.

C. Drawings and Specifications are intended to include all work and materials necessary for completion of the work. Any incidental item of material, labor or detail required for the proper execution and completion of the work and omitted from either the drawings and specifications or both, but required by governing codes local regulations, trade practices, operational functions, and good workmanship, shall be provided as part of the Contract Work without extra charge, even though not specifically detailed or specified.

1.03 SITE AND PROJECT DOCUMENT EXAMINATION:

A. Submission of a proposal is considered evidence the Contractor has visited site, examined Drawings and Specifications of all trades including Architectural, Structural and Mechanical, and fully informed himself with all project and site conditions, and is proficient, experienced and knowledgeable of all standards, codes, ordinances, permits and regulations which affect his respective trade, and that all costs are included in his proposal.

B. The Electrical Contractor and/or Sub-Contractor shall insure all required permits, and assessments have been obtained prior to any work beginning. Contractor shall verify requirement to include privilege fees, plan review fees, and permits as part of his formal bid.

C. The Pre-Bid conference is mandatory for Electrical Contractors to bid this project. Verify time and date with the Architect.

1.04 STANDARDS, CODES AND PERMITS:

A. Refer to Division 1, General Requirements and Supplementary Conditions.

B. All work under Electrical Sections shall comply with latest edition of applicable standards and codes of the following, including local codes and variances:
   1. NECA - Standards for Installation
   2. NFPA - National Fire Protection Association
   3. NEC - Latest edition of NFPA 70
   4. UL - Underwriter's Laboratories
   5. NEMA - National Electric Manufacturers Association

6. NESC - National Electric Safety Code (H13)
7. OSHA - Occupational Safety and Health Act
8. IEEE - Institute of Electrical and Electronics Engineers

C. All work shall be provided and tested in accordance with all applicable local, county, state laws, ordinances, code rules and regulations, including Michigan Department of Labor, General Rules, Part 8-Electrical Code Rules.

D. No work shall be covered or enclosed until work is tested in accordance with applicable codes and regulations, and successful tests witnessed and approved by authorized inspection authority. Written approvals shall be secured by Contractor and submitted to Engineer before final acceptance of work.

1.05 SUBMITTALS:

A. Proposal Supplement:
1. Contractor to submit one (1) copy of Proposal Supplement - SECTION 26 00 10 - ELECTRICAL EQUIPMENT AND MATERIALS, at the time of Bid opening, listing the manufacturers upon which his bid was based, including all items being provided by Sub-Contractors.
2. After Proposal Supplement and Sub-Contractors are approved, no deviation shall be permitted without written approval of Engineer.

B. Shop Drawings:
1. Submit nine (9) hard-copies or one (1) electronic copy of shop drawings on all equipment and materials indicated in the specifications or on drawings.
2. At the time of submittal for review by the Engineer, shop drawings shall include signatures or stamps indicating that the Contractor and/or the Sub-Contractor has reviewed the submittals and has coordinated the required space, quantities required, services and work of other trades for the equipment or system being submitted.
3. Submittals shall be in the form of bound folders with the name of the Project, Architect, Engineer and the submitting Contractor indicated on the cover. Submittals requiring drawings too large to be bound into the folder shall be folded and inserted in pockets bound into the folder.
4. Submit complete manufacturer's shop drawings of all equipment, accessories and controls, including dimensions, weights, capacities, construction details, installation, controls, wiring diagrams, and motor data.
5. Engineer's approval of show drawings is for general application only and is a service only and not considered as a guarantee of total compliance with or as relieving Contractor of basic responsibilities under all Contract Documents, and does not approve changes in quantities, time or cost.
6. After approval, each Contractor is responsible to provide information to all other trades involved in, or affected by, installation of his equipment and work.

C. Operating and Maintenance Instructions and Manuals:
1. Electrical Contractor shall provide for all items of equipment three (3) bound and indexed sets of operating/installation and maintenance instructions to Engineer for approval. After approval, manuals will be given to Owner by the Engineer.
2. Manuals shall include a complete set of shop drawings submitted, indexed with tabs for each section.

1.06 ELECTRICAL SERVICE REQUIREMENTS:

A. Permanent Electrical Service:
1. The Electrical Contractor is to verify with the Electrical Utility Company the electrical system amperage, voltage and phase and report any variations from what is indicated on the drawings to the Engineer. Electrical Contractor is to obtain written verification of the available symmetrical and asymmetrical RMS fault current from the Electrical Utility Company. Basis of design and bidding shall be a minimum of 22,000 system integrated A.I.C.on "MDP" overcurrent devices and branch circuit panelboard overcurrent devices, unless otherwise noted on the plans.

2. The Electrical Contractor shall select the over current protection devices and coordinate with the fault current. Submit a list of the devices and how coordination will be achieved. This submittal shall be in the form of a shop drawing.
3. Any costs from the Electrical Utility Company associated with bringing permanent power to the site shall be paid for by the Owner.

PART 2 PRODUCTS

2.01 STANDARDS:

A. All products shall be of established manufacturers regularly engaged in making type of materials to be provided and complete with all parts, accessories, trimmings, connections, etc. as specified in detail or as described in manufacturer's catalog.

B. All material shall be labeled or listed by Underwriter's Laboratories, Inc. Assembled electrical equipment supplied to the job site shall be listed or labeled and/or approved by the authority having jurisdiction.

2.02 SUBSTITUTION AND CHANGES:

A. Contractor and/or Equipment Supplier may propose alternate equipment or materials of EQUAL or better quality, function, performance, durability and appearance. This information is to be submitted to the Engineer's Office ten (10) working days prior to bid due date to allow for proper review time and to issue an addendum incorporating the acceptable substitution(s). It is the submitter's responsibility to provide sufficient material for review as required by Engineer's Office. Acceptance and approval is the responsibility of the Engineer.

B. Contractor and/or Equipment Supplier is liable for any added costs to himself or others and is responsible for verifying dimensions, clearance and roughing-in requirements, when product not named as the basis of design are used and is responsible for advising other Contractors of variations and submit revised drawing layout for approval of Engineer.

C. See Section 26 00 10 for voluntary alternates.
1. No substitutions will be accepted after bids are received. The lighting or electrical equipment specified herein has been carefully chosen for it's ability to meet the luminous performance and/or design criteria of this project. Substitutions in all likelihood will be unable to meet all of the same requirements as the specified equipment.
2. When only one manufacturer is listed within the description of the luminaire or electrical equipment, the design engineering or architectural aesthetics will not allow substitution of other manufacturer.
3. When two or more manufacturers are listed within the description of the luminaire or electrical equipment, the Contractor may elect to submit to the Engineer a substitute fixture for review. All submittals must follow paragraph 2.02.A of this section.
4. Substitution submittals shall consist of a physical description, dimensioned drawing and complete photometric and electric data of the proposed lamp, luminaire or electrical equipment. Working samples may be requested and shall be supplied to the Engineer for a visual check of finish and operating characteristics.
5. Contractor will be responsible for ALL costs (engineering time, manufacturer's costs, distributor costs, etc.) incurred to replace equipment not approved if substitutions are made by the distributor, manufacturer's rep., contractor or subcontractor.

2.03 EQUIPMENT REQUIREMENTS AND CONNECTIONS:

A. Motor Starters and Controls:
1. Electrical Contractor shall provide all manual or magnetic motor starters and combination motor starter disconnects as required for all motors as indicated on all Electrical Drawings.
2. Mechanical Contractor shall provide factory installed motor starters integral with packaged equipment containing thermal overcurrent protection in all underground conductors with heater coils selected for specific motor usage for all motors.

B. Electrical Wiring and Controls:
1. Mechanical Contractor shall furnish and install all motors, drives, and controllers integral to equipment and factory-mounted controls for all mechanical equipment.

2. Mechanical Contractor or Temperature Control Contractor shall furnish and install all electrical devices requiring mechanical connections, and/or electrical connections, such as pressure switches, limit switches, float switches, solenoid valves, motor operated valves, motor operated dampers, fire stats, freeze stats, thermostats, override timers, E.P.'s, P.E.'s, temperature control cabinet, air compressor with starter, etc.
3. Temperature Control Contractor or Mechanical Contractor shall furnish and install all power and Class 2 and 3 wiring, conduit, boxes for their association equipment in 2.03, B, 2.
4. Electrical Contractor shall install all power wiring, conduit to motors and/or factory mounted control panels as indicated on Electrical Drawings or as indicated in Specifications.
5. All electrical wiring work by Mechanical Contractor and Temperature Control Contractor shall be in accordance with Division 26 requirements.

PART 3 EXECUTION

3.01 COORDINATION OF ELECTRICAL WORK:

A. The Electrical Contractor shall be responsible for all Sub-Contractors and Suppliers, and include in his bid all materials, labor and equipment involved in accordance with all local customs, rules, regulations, jurisdictional awards, decisions and secure compliance of all parts of the Specifications and Drawings regardless of Sectional inclusion in these Specifications.

B. The Electrical Contractor and Sub-Contractor shall be responsible for all parts applicable to his trade in accordance with the Specifications and Drawings, and shall be responsible for coordinating locations and arrangements of his work with all other relevant Mechanical, Architectural, Structural and Electrical Contractor's Specifications, Drawings and Shop Drawings.

3.02 EQUIPMENT CLEARANCE:

A. Electrical Contractor to coordinate with the Mechanical Contractor's equipment location to insure adequate clearance is maintained as required by the National Electrical Code and applicable state and local codes, as well as accessibility for future maintenance and operation.

B. Electrical work shall be arranged with building construction to provide minimum 6'-8" overhead clearance where possible.

3.03 WALL, FLOOR AND CEILING OPENINGS:

A. Locate all openings and advise the General Contractor of details and templates of all openings necessary for inspection of electrical work.

B. In general, openings and required lintels shall be provided through the General Contractor. Size and location is the responsibility of this Contractor. Cracks and rough edges left following installation of equipment shall be caulked or covered by Electrical Contractor.

C. Perform or pay for all cutting, fitting, repairing, patching and finishing of work of other sections where it is necessary to disturb such work to permit installation of electrical work.
   1. Repair or replace existing or new work disturbed.

3.04 FIELD CHANGES:

A. The Contractor shall not make any field changes that affect timing, costs or performance without written approval from the Architect/Engineer in the form of a Change Order, Field Change Order or a Supplemental Instruction. The Contractor assumes liability for any additional costs for changes made without such instruction or approval. Should any unauthorized change be determined by the Architect/Engineer as lessening the value of the project, a credit will be determined and issued as a change to the Contract.

3.05 PROJECT CLOSEOUT:

A. Final Acceptance and payment will only be made after final punchlist completion and receipt at the Engineer's Office of:
   1. All Guarantees/Warranties

2. Operating and Maintenance Instruction Manuals
3. Record Drawings (As Builts)
4. Certificates of Inspection
5. Test Reports
6. Lamps and ballasts.

3.06 CERTIFICATES OF INSPECTION AND TEST REPORTS:

A. Submit to the Engineer's Office evidence that installation has been inspected and approved by local or state electrical inspector and/or the authority having jurisdiction.

3.07 GUARANTEES AND WARRANTIES:

A. At the end of a one year period of continuous operation, make a complete inspection of all systems, fixtures, equipment, safety devices and controls to insure equipment is operating properly, and report to Engineer in writing.

3.08 RECORD DRAWINGS:

A. Maintain a white-print set of Electrical Contract Drawings in clean, undamaged condition for markup of actual installation on Electrical Contract Drawings which vary substantially from the work as shown. These drawings are to be available for inspection by the Engineer on a weekly basis. Drawings shall indicate at a minimum the routing of all conduits over 2" on size, revised circuiting, revised panel schedules, emergency lighting controller (EPCs, BLTCs, etc.) locations, and addendum, bulletin and field changes.

3.09 OPERATING AND MAINTENANCE INSTRUCTIONS:

A. Provide instruction of Owner's personnel in operation and maintenance procedures for all systems equipment.

B. Provide 3 - bound & tabbed sets of operating & maintenence instruction manuals for all electrical equipment

3.10 PLACING SYSTEMS INTO OPERATION:

A. Electrical Contractor shall be responsible for all startup procedures, system checks and balancing associated with his equipment.

B. All equipment shall be installed, tested and operated in accordance with manufacturer's recommendations at normal operating conditions.

C. All permanent electrical equipment operated during construction periods shall be cleaned and damaged equipment replaced.

3.11 ADJUSTMENTS AND BALANCING:

A. Contractor shall make all necessary adjustments to equipment installed or connected by him under this contract so as to insure proper operation of the same.

3.12 GUARANTEES AND WARRANTIES:

A. All labor, materials and equipment shall be guaranteed by Contractor and/or warranted by Manufacturer for one year after acceptance date and/or one normal continuous complete seasons operation applicable to equipment or system except where specified longer for special equipment. Contractor shall secure such warranty from all Suppliers (not one year from shipment date), or Contractor to assume warranty.

B. Acceptance date of substantial completion shall be Owner occupancy as determined by Architect/Engineer.

C. Contractor shall make all necessary alterations, repairs, adjustments, replacements during guarantee periods as directed by Architect/Engineer to comply with Drawings and Specifications at no cost to Owner.

D. Repair or replacements made under guarantee bear further one year guarantee from date of acceptance of repair or replacement.

3.13 IDENTIFICATION:

A. All service switches, motor disconnects, controllers, etc., whether or not furnished under this Division shall be marked to identify the equipment served and the origin of the power source. Distribution panels, branch panels and switchboards shall be identified as to the designation indication on the Contract Drawings and voltage characteristics. Individual switches in Distribution Panels and Switchboards shall be identified as to equipment being fed.

B. All identification shall be done with engraved 5-ply lamacoid plates with ¼" white lettering on a black background. "Dymo" or tape markers ARE NOT acceptable.

C. Concisely and clearly type out all branch panel schedules indicating room or area served along with the item(s) connected to each circuit.

D. See Electrical Drawing Detail for additional identification requirements.

3.14 TRAINING:

A. The option of video taping any and all training sessions shall be given to the Owner at no additional cost, with the Contractor conducting the video taping and with two (2) copies of all tapes being turned over to the Owner for future use.

B. E.C. shall conduct 2 - 2 hour training session on the operation and controls of all electrical equipment. Notify owner 72 hours prior to session.

C. E.C. shall conduct 2 - 2 hr training sessions on the operation & control of the Fire Suppression Monitoring System. Notify owner 72 hours prior to session.

D. E. C. shall conduct 2 - 2 hr. training session on the operation & control of the lighting control systems, which includes the occupancy sensors, the over-ride switches, and the lighting control panels. Notify owner 72 hours prior to session.

END OF SECTION

SECTION 26 00 10
ELECTRICAL EQUIPMENT AND MATERIALS

PART 1 GENERAL

1.01 INSTRUCTION:

A. The Electrical Contractor is to either copy or remove this specification section from the spec book and complete as follows:
   1. Indicate the specific manufacturer on which the bidder's base bid price is based in the blank space provided.
   2. All equipment is to be bid as specified. Material or equipment from another manufacturer may be bid as a Voluntary Alternate, but the dollar amount must be shown as an "Add" or "Deduct" to the base bid. Provide the name of the alternate manufacturer in the space provided.
   3. Insert the name(s) of each subcontractor used in your bid in the space provided in Part 3.
   4. This form shall be submitted with the bid.

1.02 RELATED DOCUMENTS:

A. The other Contract Documents complement the requirements of this Section. The General Requirements apply to the work of this section.

1.03 DEVIATIONS FROM SPECIFIED MATERIAL:

A. See Section 26 00 00, Part 2, Paragraph 2.02 - Substitutions and Changes. Base bid shall be based on manufacturers listed in this specification or on the drawings.

PART 2 PRODUCTS

2.01 THE FOLLOWING IS A LIST OF APPROVED MANUFACTURERS, GROUPED ACCORDING TO TYPES OF MATERIALS OR EQUIPMENT.

A. Wiring Devices:
   1. Pass & Seymour, Hubbell, Leviton, and Cooper
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

B. Retractable Cord Reel:
   1. Reelcraft, Hubbell, Appleton, and K&H Industries
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

C. Branch Panels:
   1. Square D
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

D. Safety Switches:
   1. Square D
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

E. Motor Controls:
   1. Square D
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

F. Generator: (Also provide generator calculation report and 263213-3.08 compliance forms when this form is submitted)
   1. Generac, Cummins Bridgeway, and Caterpillar
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

G. Automatic Transfer Switch:
   1. ASCO and Russ Electric
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

H. Surge Protective Devices
   1. ASCO and Raycap
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

I. Fire Suppression Monitoring System
   1. Edwards
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

J. Lighting Controls, including lighting control panelboards, room controllers and vacancy/occupancy sensors
   1. Cooper
      a. Voluntary alternate_____
      b. Add $_____ Deduct $_____

K. Lighting Fixtures:
   1. Tag A: Cooper
      a. Voluntary alternate_____ Add $_____ Deduct $_____
   2. Tag B: Cooper
      a. Voluntary alternate_____ Add $_____ Deduct $_____
   3. Tag C series: Cooper
      a. Voluntary alternate_____ Add $_____ Deduct $_____
   4. Tag D series: Cooper
      a. Voluntary alternate_____ Add $_____ Deduct $_____
   5. Tag EX: Cooper
      a. Voluntary alternate_____ Add $_____ Deduct $_____
   6. Tag H & H1: Cooper
      a. Voluntary alternate_____ Add $_____ Deduct $_____
   7. Tag J series: Cooper and Shakespeare
      a. Voluntary alternate_____ Add $_____ Deduct $_____
   8. Tag S1: Cooper
      a. Voluntary alternate_____ Add $_____ Deduct $_____

PART 3 SUBCONTRACTORS

3.01 INSERT THE NAME OF EACH SUBCONTRACTOR AND WORK TO BE PERFORMED BELOW:

A. Subcontractor_____
   Work Performed_____

B. Subcontractor_____
   Work Performed_____

C. Subcontractor_____
   Work Performed_____

END OF SECTION

SECTION 26 00 50
BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 MATERIALS:

A. All materials and equipment furnished for installation on this project shall be new and in strict accordance with Contract Documents. All packaged materials shall be delivered in their original containers which shall show the manufacturer's name and the identifying designations as to size, quality, etc. Materials delivered to the project unmarked or mutilated packages will be ordered to be removed from the site at once. Materials or equipment judged as "damaged" by the Architect/Engineer shall be removed from the project and site.

B. Should any dispute arise to the quality of any material, the decision shall rest entirely with the Architect/Engineer and shall be based on the requirement that all materials furnished shall be first class in every respect, and what is usual or customary in erecting other buildings shall in no way enter into the consideration or decision whatever as it pertains to the project under consideration.

C. All materials and equipment furnished under work of all Division 16 sections shall be UL approved and listed, and shall bear the Underwriter's Label.

1.02 SUBMITTALS:

A. Submit shop drawings for the following: (See 26 00 00 1.05 B 1 thru 6)
   1. Wiring devices.
   2. Retractable Cord Reels.
   3. Motor starters/contactors.
   4. Branch circuit panelboards.
   5. Safety switches / breakers.
   6. Generator.
   7. Automatic Transfer Switches.
   8. Surge Protective Devices.
   9. Indoor and outdoor light fixtures (See 26 51 00 1.03 A thru D).
   10. Lighting Controls, including lighting control panelboards, and vacancy/occupancy sensors
   11. Fire Supression Monitoring System.

PART 2 PRODUCTS

2.01 RACEWAYS:

A. Aluminum conduit is not acceptable in this Contract.

B. Rigid Metal Conduit:
   1. Rigid metal conduit shall be hot dipped galvanized steel, meeting Federal Standard WW-C-581.
   2. Threaded fittings shall be used on rigid metal conduit.

C. Electric Metallic Tubing:
   1. Electrical metallic tubing shall be standard weight, meeting Federal Standard WW- C-563 and bear the manufacturer's name and Underwriter's Label on each length. Maximum permissible size tubing shall be 4".
   2. Provide compression-type steel fittings or set screw-type steel fittings. Crimp-type connectors are not acceptable.

D. Flexible Metal Conduit:
   1. Flexible metallic conduit shall meet Federal Standard WW-C-566 and is to have separate grounding conductor. Minimum permissible size shall be 1/2".
   2. Fittings shall be malleable iron, threaded type.

E. Liquid-Tight Flexible Metal Conduit:
   1. Liquid-tight flexible metal conduit shall be single strip, flexible, continuous, interlocked, and double-wrapped steel. It shall be galvanized inside and outside, with a liquid-tight jacket of flexible polyvinyl chloride (PVC). Minimum permissible size shall be 1/2".
   2. Connectors shall be insulated throat, malleable iron.

F. Liquid-Tight Flexible Non-Metallic Conduit:
   1. Liquid-tight flexible non-metallic conduit shall be single strip, flexible polyvinyl chloride (PVC). Minimum permissible size shall be 1/2".
   2. Connectors shall be non-metallic (PVC) compression type UL labeled and listed to be used on liquid-tight flexible non-metallic conduit.

G. Rigid Non-Metallic Conduit:
   1. Rigid non-metallic conduit (PVC) shall be Schedule 40, rigid heavy wall polyvinyl chloride, 90 degrees C., UL rated.
   2. Fittings shall be solvent weld type of the same material as the conduit.
   3. All 45 degree bends or greater shall be made with rigid metal conduit fittings.

H. Wireways:
   1. Wireways shall be lay-in type and shall be UL listed as a wireway or auxiliary gutter. It shall be constructed with a hinged cover and knockouts. It shall be primed with a corrosion resistant primer and gray epoxy finish.

I. Metal-Clad Cable:
   1. Metal-Clad Cable is NOT acceptable in this project.

2.02 WIRE AND CABLE:

A. All wiring shall be copper and shall be installed in conduit or tubing unless specified otherwise.

B. All wire shall be new and in the original cartons or on manufacturer's shipping reels.

C. No wire smaller than #14 may be used unless specified under descriptions of special systems. Wire #14 and larger shall be stranded.

D. All branch circuit wiring shall be color coded black, red, blue, phases and white neutral for 120/208v, 3 phase, 4 wire system and brown, orange, yellow and white stripped neutral for 277/480v, 3 phase, 4 wire system. All grounding / bonding conductors shall be green or bare. Phase color consistent throughout the entire branch circuit system.

E. All neutral runs including feeders shall be white full length of conductor or identified per NEC.

F. Select from the following wire types to comply with the project's installation requirements and NEC standards.
   1. Type THHN/THWN rated installation. 600 volt, 90 degrees C., in conduit, stranded copper, size No. 14 AWG up to and including No. 10 AWG.
   2. Type THWN-2 rated insulation, 600 volt, 90 degrees C., in conduit, stranded copper, size No. 8 AWG up to No. 750 MCM AWG.

2.03 WIRE CONNECTORS AND JOINTS:

A. All conductors #8 AWG and smaller shall be joined with electrical spring connectors with vinyl insulating cap. Conductors larger than #8 shall be joined by compression type connectors.

2.04 OUTLET BOXES:

A. Ceiling outlet boxes shall be 4" octagon, 2 1/8" deep, with fixture hickey, and supported to withstand 50 pounds.

B. Convenience outlet and switch boxes shall be a minimum 4"sq. x 2 1/8" deep with 1 or 2 gang, 2" deep plaster ring. When installed in poured walls, 3 1/8" minimum deep masonry box shall be used; when installed in masonry blocks, minimum 4"sq. x 2 1/8" deep with 1 or 2 gang, 2" deep plaster ring shall be used.

2.05 JUNCTION BOXES AND PULL BOXES:

A. When used, pull boxes and junction boxes shall be galvanized and have flat steel covers fastened with screws and set flush with the finished surface and located in an accessible area. When installed in damp locations, gaskets and seals shall be provided. Junction boxes shall be sized to meet N.E.C. Standards based on conduit and conductors. Provide identifying labels on each box.

2.06 WIRING DEVICES:

A. Receptacles:
   1. Receptacles shall be commercial specification grade.
      a. 20 Amp, 125 Volt, duplex, ground fault, weatherproof (NEMA 5-20R).
      b. 20 Amp, 125 Volt, duplex, ground fault (NEMA 5-20R).
      c. 20 Amp, 125 Volt, duplex (NEMA 5-20R).
      d. 30 Amp, 125/250 Volt (NEMA 14-30R).
      e. 50 Amp, 125/250 Volt (NEMA 14-50R).

B. Wall Switches (Snap Switches):
   1. Switches shall be specification grade, totally enclosed molded composition, silent type, spring action silver contacts, and rated 120/277 volts A.C. All switches shall be binding screw type.
   2. Switches shall be rated at 20 Amp.

C. Device Plates:
   1. Plates shall be brushed smooth stainless steel, except plates used on surface mounted boxes. Surface mounted outlets plates shall be raised, pressed metal type. Mounting screws shall be metal with same finish as plate and with countersunk head. Plates shall be single ganged, or combination, to accommodate arrangement indicated on drawings.

D. General Retractable Cord Reels:
   1. Retractable cord reels shall be heavy duty power cord reel made from welded heavy gauge steel, integral GFCI protection, 125 Volts, 15 Amps, 12 AWG, 45' retractable cord with a triple outlet end and adjustable cord stop.
   2. Retractable cord reel shall be equal to Reelcraft #L4545-123-9G.

E. 138kV Mobile Substation Retractable Cord Reel:
   1. Retractable cord reels shall be heavy duty power cord reel made from welded heavy gauge steel, 125 Volts, 50 Amps, 6 AWG, 50' retractable cord with an adjustable cord stop.
   2. Retractable cord reel shall be equal to K&H Industries #RTMH4L-WW-K6K.

F.

2.07 MOTOR CONTROLLERS:

A. 120 volt, less then 1/4hp:
   1. Provide motor toggle switch with heater, pilot light and lockout guard. Mount adjacent to motor. Size heater per NEC and manufacturer's recommendations. Based on Sq-D #FGJ5P (surface mount) or # FF1P FL1 (flush mount)

B. 120 volt, 1/3hp to 1hp:
   1. Provide NEMA rated combination magnetic motor starter and disconnect in appropriate enclosure with H.O.A. selector switch, red pilot light, 1 - N.O. & 1 - N.C. Aux. coil. Combination motor starter disconnect shall be Sq-D Class 8539 with breaker sized for respective motor load or two speed starters as shown on plans. Mount within sight and within 50' of motor. Size heaters per NEC and manufacturer's recommendations.

C. 208v, 1ph; 208v, 3ph; 480v. 1ph; and 480v, 3ph; 1/2hp or larger:
   1. Provide NEMA rated combination magnetic motor starter and disconnect in appropriate enclosure with H.O.A. selector switch, red pilot light, 120 volt control transformer, 1 - N.O. & 1 - N.C. Aux. coil. Combination motor starter disconnect shall be based on Sq-D Class 8539 with breaker sized for respective motor load or two speed starters as shown on

plans. Mount within sight and within 50' of motor. Size heaters per NEC and manufacturer's recommendations.

2.08 BRANCH CIRCUIT PANELBOARDS:

A. Branch circuit panelboards shall be of the circuit breaker type with main lugs or main switch as indicated on drawings rated at 120/208 volts maximum, 3 phase, 4 wire AC capable of withstanding availible fault current and be U.L. labeled and listed, surface or flush mounted, bottom or top fed with ground bar kits. Circuit breakers shall be system series rated. Panelboards shall be based on Square "D" type NQ.

2.09 FUSES:

A. Fuses 600 Amperes and Less: Dual element, current limiting, time delay, one-time fuse, 250 or 600 volt, UL Class J. Supply Owner with 3 - spare fuses of each size if applicable.

B. Fuses 601 Amperes and Larger: Current limiting, fast-acting, one time fuse, 600 volt, UL Class L. Supply Owner with 1 - spare fuse of each size if applicable.

C. Interrupting Rating: 200,000 rms amperes.

2.10 SAFETY SWITCHES:

A. Furnish and install all required safety switches.

B. Safety switches shall be NEMA heavy duty type "HD", fusible or non-fusible as shown on drawings and be U.L. labeled and listed. Switches shall be furnished in NEMA-1 general purpose dry location enclosures unless otherwise shown on drawings. Weatherproof switches shall be NEMA-3R (raintight).

C. Switches shall be horsepower rated with interlocking provisions to prevent unauthorized opening of the switch covers in the "ON" position. Switches shall be capable of being physically locked in the open (off) position.

D. Switches shall be Sq-D type "HD" 250v or 600v, respectively.

PART 3 EXECUTION

3.01 RACEWAYS:

A. Conduit or tubing shall be installed in a manner which complies with all applicable provisions of the National Electrical Code and at least six inches from parallel runs of steam pipes, flues, or hot water pipes.

B. Ends of all conduit or tubing shall terminate in a bushing or fitting having factory installed insulating liners. Provide plastic bushings on all conduit or tubing with wire larger than #4 AWG. Exposed runs shall be supported by hangers, clamps, or straps secured by toggle bolts in hollow construction or expansion bolts or inserts in poured or brick walls. No lead anchors shall be allowed

C. Every precaution shall be taken to protect the conduit from damage and from water, dirt, concrete, etc.., getting into the system during construction. Capped bushings shall be used on all conduit terminations until wire is installed. If, in the opinion of the Engineer, conduit or tubing has become damaged or contains unremovable foreign matter, it shall be replaced at the Contractor's expense.

D. Rigid metal conduit shall be used in all poured construction, fill, outside masonry walls, areas exposed to weather, under drives and walks, and in areas where tubing may become damaged..

E. Rigid non-metallic conduit (PVC) may be used in lieu of rigid metal conduit below grade or where concealed in concrete. Provide a separate bare stranded copper grounding conductor in the raceway sized in accordance with Table 250.122 of the NEC.

F. Electrical metallic conduit (EMT) shall be used for feeders and branch circuits above ground & above suspended accessible ceilings; for switch and receptacle legs which terminate above suspended accessible ceilings; for exposed feeders and branch circuits; for switch legs in moveable partitions.

G. Flexible metal conduit shall be used for connections to the following equipment: lighting fixtures only. Maximum length of flexible metallic conduit shall be 6'-0". Longer length may be permitted at the discretion of the Owner or as indicated on the plans. Minimum size shall be ½". Flexible metal conduit used for lighting fixture connections shall be "Greenfield" type. Fittings shall be insulated throat, flex-steel connectors.

H. Use liquid-tight flexible steel conduit and liquid-tight flexible non-metallic conduit for final connections to all indoor and outdoor motors and mechanical equipment with a length not to exceed 36".

I. At all wall penetrations, space around circuits shall be filled with mortar or other approved filler. Penetrations through walls, floors or ceilings must not alter the fire rating of the assembly.

J. All conduit and boxes shall be flush mounted and concealed. No exposed conduit will be allowed, except in electrical and mechanical spaces, and where specifically noted.

3.02 WIRE AND CABLE:

A. All wiring shall be installed in approved raceways. Conductors shall be continuous between outlets or junction boxes with splice made only within such boxes.

B. Any branch circuits over 50 feet in length shall be installed with one wire size larger than the circuit rating. Example: 1P/20amp breaker with #12 THHN wire run 50'+ shall be increased to a #10 THHN wire.

3.03 OUTLET BOXES:

A. Set boxes squarely with faces flush to finished surfaces. The exact location of all outlets shall be approved by the Architect/Engineer before same are place and Contractor shall consult Architect/Engineer at all times relative to the location of outlets. No outlets shall be placed behind plumbing or heating pipes or where they will interfere with ducts, pipes, equipment, or other work.

B. Each outlet shall be rigidly supported from the building construction (independent of the raceway system).

3.04 WIRING DEVICES:

A. Receptacles shall be mounted approximately 18" above floor or at other heights indicated on drawings.

B. E.C. shall be responsible for protection of receptacles from painting, plastering, etc.

C. Wall switches shall be mounted approximately 4'-0" above floor unless they interfere with wainscoting or trim.

D. E.C. shall be responsible for masking switches for protection from painting, plastering, etc.

E. E.C. shall confirm all door swings with Building Trades Contractor before installing switches.

F. Wall plates shall be installed plumb and level with all edges in contact with attaching surface.

G. E.C. shall confirm all ADA and barrier free requirements are meant and install according to their regulations.

3.05 SUPPORTS AND HANGERS:

A. Provide and install necessary steel brackets, rods, clamps, etc., for support of all work under this contract. All supports shall be plated or painted and shall be secured to structural members after Architect's approval.

3.06 SLEEVES AND INSERTS:

A. This Contractor shall be responsible for the proper location of all sleeves, chases, openings and inserts for the installation of his equipment.

B. Holes through walls, floors or structural members shall be located only where permitted by the Architect.

3.07 UNDERGROUND WORK:

A. Prior to any underground excavating, trenching, pole base augering, etc. call MISS DIG at 1-800-482-7171 no less than 72 hours in advance of any earthwork.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Wiring connectors.

C. Electrical tape.

D. Oxide inhibiting compound.

E. Wire pulling lubricant.

F. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

G. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

J. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

K. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

L. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

M. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

H. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
   3. Color Code:
      a. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

2.05 ACCESSORIES

A. Electrical Tape:
   1. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and

sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

B. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

D. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

E. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

F. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

G. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

H. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

I. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.

J. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

K. Insulate ends of spare conductors using vinyl insulating electrical tape.

L. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

M. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

1.02 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.03 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms or less.

1.04 SUBMITTALS

A. Product Data: Provide for grounding electrodes and connections.

B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

C. Project Record Documents: Record actual locations of components and grounding electrodes.

D. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Metal In-Ground Support Structure:
      a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
   4. Concrete-Encased Electrode:
      a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
   5. Ground Rod Electrode(s):
      a. Provide two electrodes unless otherwise indicated or required.
      b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
   6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
   7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
      a. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
      b. Where ground bar location is not indicated, locate in an accessible location as close to the service entrance as possible, as well as one as close as possible to the Communications Rack.

F. Service-Supplied System Grounding:
   1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
   2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

H. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

D. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

F. Install ground electrodes & building steel at locations indicated. Install bonding jumper to internal building metallic water piping system. (Please note that the new wells and associated underground water lines maybe plastic PVC and can not be used as a Grounding Electrode). Install additional rod electrodes and/or building steel columns as required to achieve specified resistance to ground (5 ohms) or less. .

G. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

H. Provide bonding to meet requirements described in Quality Assurance.

I. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 26 05 33.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. PVC-coated galvanized steel rigid metal conduit (RMC).

D. Flexible metal conduit (FMC).

E. Liquidtight flexible metal conduit (LFMC).

F. Electrical metallic tubing (EMT).

G. Rigid polyvinyl chloride (PVC) conduit.

H. Liquidtight flexible nonmetallic conduit (LFNC).

I. Reinforced thermosetting resin conduit (RTRC).

J. Conduit fittings.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2005.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

K. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

N. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

O. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

P. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

Q. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

R. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

S. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

T. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches (51 mm).

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
   5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
   6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
   7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.

D. Embedded Within Concrete:
   1. Within Slab on Grade: Not permitted.
   2. Within Slab Above Ground: Not permitted.
   3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use PVC-coated galvanized steel rigid metal conduit, electrical metallic tubing (EMT), or rigid PVC conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

K. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
1. Maximum Length: 6 feet (1.8 m).

L. Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit.
2. Damp, Wet, or Corrosive Locations: Use liquidtite flexible nonmetallic conduit.
3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
   a. Transformers.
   b. Motors.

2.02 CONDUIT REQUIREMENTS

A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 1/2 inch (16 mm) trade size.
2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
3. Control Circuits: 1/2 inch (16 mm) trade size.
4. Underground, Interior: 3/4 inch (21 mm) trade size.
5. Underground, Exterior: 1 inch (27 mm) trade size.

D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).

C. PVC-Coated Fittings:
1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.06 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.07 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.08 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression (gland) or set-screw type.
a. Do not use indenter type connectors and couplings.

2.09 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.10 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

2.11 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: Per manufacturer's recommendations.

C. Fittings: Same type and manufacturer as conduit to be connected.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify routing and termination locations of conduit prior to rough-in.

E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.

F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

G. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

H. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   5. Unless otherwise approved, do not route conduits exposed:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   7. Arrange conduit to maintain adequate headroom, clearances, and access.

8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
14. Group parallel conduits in the same area together on a common rack.

I. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.

J. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

K. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

7. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

L. Underground Installation:
   1. Provide trenching and backfilling in accordance with Section 31 23 16.13.
   2. Minimum Cover, Unless Otherwise Indicated or Required:
      a. Underground, Exterior: 24 inches (610 mm).
      b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
   3. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.

M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
   3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
   4. Where conduits are subject to earth movement by settlement or frost.

N. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
   1. Where conduits pass from outdoors into conditioned interior spaces.
   2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

O. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

P. Provide grounding and bonding in accordance with Section 26 05 26.

Q. Identify conduits in accordance with Section 26 05 53.

3.03 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation.

END OF SECTION

SECTION 26 05 33.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 33.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCTE 77 - Specification for Underground Enclosure Integrity; 2013.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
   a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As required.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
4. Provide logo on cover to indicate type of service.
5. Applications:
   a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 8 load rating.
   b. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
   a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
   2. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
   3. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
   3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N. Underground Boxes/Enclosures:
   1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
   2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

Q. Close unused box openings.

R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

S. Provide grounding and bonding in accordance with Section 26 05 26.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Underground warning tape.

E. Warning signs and labels.

F. Field-painted identification of conduit and boxes.

1.02 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.03 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
   2. Service Equipment:
      a. Use identification nameplate to identify each service disconnecting means.
   3. Emergency System Equipment:
      a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
      b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
   4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
   5. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
   6. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
   7. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
      a. Service equipment.
      b. Industrial control panels.
      c. Motor control centers.
      d. Elevator control panels.
      e. Industrial machinery.
   8. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter

socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
   a. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
   2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
   3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
      a. At each source and load connection.
      b. Within boxes when more than one circuit is present.
      c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

C. Identification for Boxes:
   1. Use voltage markers to identify highest voltage present.
   2. Use voltage markers or color coded boxes to identify systems other than normal power system.
      a. Color-Coded Boxes: Field-painted in accordance with Section 09 91 23 and 09 91 13 per the same color code used for raceways.
      b. For exposed boxes in public areas, do not color code.
   3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
      a. For exposed boxes in public areas, use only identification labels.

D. Identification for Devices:
   1. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
      a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
   2. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
   3. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
   2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
   3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
   4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.

5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
a. System designation where applicable:
1) Emergency Power System: Identify with text "EMERGENCY".
b. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
a. System Designation: 1 inch (25 mm).
b. Equipment Designation: 1/2 inch (13 mm).
5. Color:
a. Normal Power System: White text on black background.
b. Emergency Power System: White text on red background.

D. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch (3 mm).

F. Color: Black text on white background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:
1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.05 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Interior Components: Legible from the point of access.
   6. Boxes: Outside face of cover.
   7. Conductors and Cables: Legible from the point of access.
   8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

SECTION 26 09 24
LIGHTING CONTROL DEVICES - VACANCY/OCCUPANCY SENSORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Wall box mounted, wall/corner mounted, and ceiling mounted occupancy sensors including dual technology, ultrasonic, and passive infrared technologies. This includes self contained PIR sensors as well as low voltage sensors that work with Switchpacks.

B. Related Sections:
   1. Section 260926 – Lighting Control Panelboards: Lighting panels (switching) controlled by Central Dimming Control System.

1.02 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)
   1. C62.41-1991 – Recommended Practice for Surge Voltages in Low Voltage AC Power Circuits.

B. ASTM International (ASTM)
   1. D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.

C. Canadian Standards Association (CSA).
   1. CSA C22.2 # 14 Industrial Control Equipment
   2. CSA C22.2 # 184 Solid-State Lighting Controls
   3. CSA C22.2 # 156 Solid-State Speed Controls

D. International Electrotechnical Commission .
   1. (IEC) 801-2 Electrostatic Discharge Testing Standard.
   2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.

E. International Organization for Standardization (ISO)
   1. 9001:2000 – Quality Management Systems.

F. National Electrical Manufacturers Association (NEMA)
   1. WD1 (R2005) - General Color Requirements for Wiring Devices.

G. Norma Official Mexicana (NOM).
   1. NOM-003-SCFI Productos eléctricos - Especificaciones de seguridad (Electrical products - Safety Specifications)

H. Underwriters Laboratories, Inc. (UL):
   1. 94 – Flammability Rating
   2. 916 – Energy Management Equipment.
   3. 508 (2005) - Standard for Industrial Control Equipment.
   4. 244A – Appliance Controls
   5. 935 (2005) - Fluorescent Ballasts

1.03 SYSTEM DESCRIPTION

A. Permanently installed
   1. Wall switch occupancy sensors
   2. Ceiling mounted occupancy sensors
   3. Switchpacks

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Specification Conformance Document: Indicate whether the submitted equipment:
   1. Meets specification exactly as stated.
   2. Meets specification via an alternate means and indicate the specific methodology used.

C. Shop Drawings; include:
   1. Load schedule indicating actual connected load, load type, and voltage per circuit, circuits and their respective control zones, circuits that are on emergency, and capacity, phase, and corresponding circuit numbers.
   2. Schematic of system.
   3. Lighting plan clearly marking product type, location and orientation of each sensor.

D. Product Data: Catalog specification sheets with performance specifications demonstrating compliance with specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer: Minimum 20 years' experience in manufacture of occupancy sensor lighting controls.

B. Manufacturer's Quality System: Registered to ISO 9001:2000 Quality Standards, including in-house engineering for product design activities.

C. Occupancy Sensing Lighting Controls:
   1. Listed by UL specifically for the required loads. Provide evidence of compliance upon request.

D. Installer Qualifications: Installer shall be one who is experienced in performing the work of this section, and who has specialized in installation of work similar to that required for this project.

E. Source Limitations: To assure compatibility, obtain occupancy sensors from a single source with complete responsibility over all lighting controls, including accessory products. The use of subcontracted component assemblers is not acceptable.

1.06 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
   1. Ambient temperature: 0° to 40° C (32° to 104° F).
   2. Relative humidity: Maximum 90 percent, non-condensing.
   3. Occupancy Sensors must be protected from dust during installation.

1.07 WARRANTY

A. Provide manufacturer's 5-year parts warranty.

1.08 MAINTENANCE

A. Make ordering of new equipment for expansions, replacements, and spare parts available to end user.

B. Make new replacement parts available for minimum of ten years from date of manufacture.

C. Provide factory direct technical support.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Eaton Lighting Systems (formerly Cooper Controls)

B. Substitutions:
   1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders.
   2. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
   3. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

4. Provide complete engineered shop drawings (including power wiring) with deviations for the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

2.02 SENSOR PERFORMANCE REQUIREMENTS

A. Sensing mechanism:
   1. Infrared: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
   2. Ultrasonic:
      a. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.
      b. Utilize Doppler shift ultrasonic detection technology.
   3. Dual technology:
      a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
      b. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.
      c. Incorporate Doppler shift ultrasonic and passive infrared motion detection technologies. Products that react to noise or ambient sound shall not be considered.

B. Power failure memory:
   1. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.

C. Designed and tested to withstand discharges without impairment of performance when subjected to discharges of 15,000 volts per IEC 801-2.

D. Products tested in identical manner, complaint to NEMA WD 7 -2011 Occupancy Motion Sensors Standards.

E. Sensor shall have time delays from 10 to 30 min.

F. When specified, sensors shall automatically adjust time delay and sensitivity settings.

G. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

H. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

I. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

2.03 LOW VOLTAGE CEILING MOUNTED OCCUPANCY SENSORS

A. Provide all necessary mounting hardware and instructions.

B. Sensors shall be Class 2 devices.

C. When requested, be able to provide customizable mask to block off unwanted viewing areas for all ceiling mounted sensors using infrared technology.

D. Provide an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options.

2.04 VACANCY WALL SWITCHES

A. Requires Manual On to activate lighting.

B. Cannot be modified to provide Automatic ON capabilities.

C. Provide a mechanical air-gap on/off function for all sensors.

D. Capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet

E. Shall accommodate loads from 0-800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180 degree coverage capability.

F. Shall be able to have their visible plastic parts replaced, for color changes in the field, without removing the body of the control from the wall and without requiring special tools.

G. Shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.

H. Shall have no leakage current to load, in manual or in Auto/Off Mode for safety purposes and shall have voltage drop protection.

I. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from Automatic On to Manual On.

J. Where specified, sensors shall offer daylighting foot-candle adjustment control and be able to accommodate dual level lighting.

K. Where specified, dual relay sensors shall offer daylighting foot-candle adjustment control for either or both relays.

L. Where specified, dual relay sensors shall offer a Bathroom Mode which keeps the second relay On for an addition 8 minutes after the first relay has been turned off.

M. Where specified, sensors shall feature a universally recognized light bulb icon for end user ease of identification of use.

N. Where specified, dual relay sensors shall feature universally recognized light bulb and fan icons for end user ease of identification of use.

O. Where specified, sensor packaging shall be 100% recycled [made entirely from post-consumer waste (100% post-consumer fiber content) as well as, 100% recyclable].

P. Sensors shall be RoHS compliant.

Q. Where specified, sensors shall have an EcoMeter that provides a visual indicator of energy usage, increasing end user awareness and reminding individuals to take control of their lighting to maximize energy savings.

R. Where specified, low voltage sensors shall have a Tracking/HVAC Mode that allows the load connected to the Form C BAS relay to remain on when the lights are turned off manually.

S. Where specified, sensors shall have a tamper-proof Automatic Only Mode that automatically turns lighting ON and OFF without requiring a user to push a button.

2.05 SENSOR SWITCHPACKS

A. Control wiring between sensors and control units shall be Class 2, 18-24 AWG, stranded U.L. Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums.

B. Integrated, self-contained unit consisting internally of an isolated load switching control relay and a power supply to provide low voltage power.

C. Shall be compatible with incandescent, magnetic or electronic low voltage, and magnetic or electronic fluorescent, as well as motor loads.

2.06 DIGITAL TIME SWITCHES

A. Product: TSW-MV

B. Provide all necessary mounting hardware and instructions.

2.07 SOURCE QUALITY CONTROL

A. Perform full-function testing on 100% of all system components and panel assemblies at the factory.

PART 3- EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's installation instructions.

B. Provide complete installation of system in accordance with Contract Documents.

C. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.

3.02 TESTING

A. Upon completion of all wiring and after all fixtures are installed and lamped, a representative shall check the installation prior to energizing the system. Each installed occupancy sensor shall be tested in the Test Mode to see that lights turn OFF and on based on occupancy.

B. At the time testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

END OF SECTION

SECTION 26 09 26
LIGHTING CONTROL PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. General specification for the relay lighting control system
   2. The Electrical Contractors, as part of the work of this section, shall coordinate, receive, mount, connect and place into operation all equipment. The electrical contractor shall furnish all conduit, wire, connectors, hardware and other incidental items necessary for the complete and properly functioning relay lighting control system as described herein and shown on the plans.

B. Related Sections:
   1. Section [260924 – Lighting Control Devices:] Occupancy sensors used in conjunction with the lighting control system.

1.02 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)
   1. C62.41-1991 – Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

B. ASTM International (ASTM)
   1. D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.

C. Canadian Standards Association (CSA) .
   1. CSA C22.2 # 14 Industrial Control Equipment
   2. CSA C22.2 # 184 Solid-State Lighting Controls
   3. CSA C22.2 # 156 Solid-State Speed Controls

D. European Commission (CE) - Harmonized European Standard.
   1. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.

E. International Electrotechnical Commission .
   1. (IEC) 801-2 Electrostatic Discharge Testing Standard.
   2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.

F. International Organization for Standardization (ISO)
   1. 9001:2000 – Quality Management Systems.

G. National Electrical Manufacturers Association (NEMA)
   1. WD1 (R2005) - General Color Requirements for Wiring Devices.

H. Norma Official Mexicana (NOM).
   1. NOM-003-SCFI Productos eléctricos - Especificaciones de seguridad (Electrical products - Safety Specifications)

I. Underwriters Laboratories, Inc. (UL):
   1. 489 (2002) - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
   2. 508 (1999) - Standard for Industrial Control Equipment.
   3. 924 (2003) - Emergency Lighting and Power Equipment

1.03 SYSTEM DESCRIPTION

A. Lighting Control System
   1. Factory assembled switching panels and interfaces and modules
   2. Low voltage wall stations and control interfaces and sensors.

1.04 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Specification Conformance Document: Indicate whether the submitted equipment either:
   1. Meets specification exactly as stated.
   2. Meets specification via an alternate means and indicate the specific methodology used.

C. Shop Drawings; include:
   1. Load schedule indicating actual connected load, load type, and voltage per circuit, circuits and their respective control zones, circuits that are on emergency, and capacity, phase, and corresponding circuit numbers.
   2. Schematic of system.

D. Product Data: Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer: Minimum 20 years experience in manufacture of energy management lighting controls.

B. Energy Management Lighting Control System:
   1. Listed by UL specifically for the required loads. Provide evidence of compliance upon request.

1.06 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
   1. Ambient temperature: 0° to 40° C (32° to 104° F).
   2. Relative humidity: Maximum 90 percent, non-condensing.
   3. Lighting control system must be protected from dust during installation.

1.07 WARRANTY

A. Provide manufacturer’s 3 year parts warranty and a limited 10-year warranty shall be provided on all relay cards. These shall be standard warranties and will be in affect for all installations from the date of invoice.

1.08 MAINTENANCE

A. Make ordering of new equipment for expansions, replacements and spare parts available to end user.

B. Make new replacement parts available for minimum of ten (10) years from date of manufacture.

C. Provide toll free factory direct technical support hotline.

D. Provide on-site service support for troubleshooting within 24 hours anywhere in continental United States.

E. Offer renewable service contract on yearly basis, to include parts, factory labor and annual training visits. Make service contracts available up to ten (10) years after date of system commissioning.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Eaton Lighting Systems (Formerly Cooper Controls) – Systems: ControlKeeper

B. Substitutions:
   1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.

2. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices and wiring. The contractor shall provide complete engineered shop drawings (including power wiring) with deviations for the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

2.02 GENERAL

A. Provide hardware that is designed, tested, manufactured and warranted by a single manufacturer.

B. Lighting Controls: Ten-year operational life while operating continually at any temperature in an ambient temperature range of 0° C (32°F) to 40° C (104°F) and 90 percent non-condensing relative humidity.

C. Designed and tested to withstand electrostatic discharges up to 15,000 V without impairmentper IEC 801-2.

2.03 PANEL / RELAY PERFORMANCE REQUIREMENTS

A. Electrolytic capacitors to operate at least 20° C below the component manufacturer's maximum temperature rating when device is under fully-loaded conditions in 40° C (104° F) ambient temperature.

B. Capable of withstanding repetitive inrush current of 50 times operating current without impacting lifetime of dimmer/relay.

C. Design and test relays to withstand line-side surges without impairment to performance.
   1. Panels: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 3,000 amps per ANSI/IEEE C62.41B.

D. Utilize air gap off, activated when user selects “off” at any control to disconnect the load from line supply.

E. Possess power failure memory such that if power is interrupted and subsequently returned, lights will automatically return to same levels (on or off) prior to power interruption within 3 seconds.

F. Non-dim circuits to meet the following requirements:
   1. Rated life of relay: Minimum 1,000,000 cycles.
   2. Load switched in manner that prevents arcing at mechanical contacts when power is applied to load circuits.
   3. Fully rated output continuous duty for inductive, capacitive and resistive loads.

G. Capable of controlling receptacle or plug loads with Latching Relay Option.

H. Serial Latching Relay Card to be used with the ControlKeeper lighting panels CKT.
   1. Rated life of relay: Minimum 1,000,000 cycles.
   2. Four 20amp relays at 120/277/347VAC
   3. Manual Override per relay
   4. Accepts up to 6 AWG wire
   5. Load switched in manner that prevents arcing at mechanical contacts when power is applied to load circuits.
   6. Fully rated output continuous duty for inductive, capacitive and resistive loads.
   7. Capable of controlling receptacle or plug loads.
   8. Eaton Lighting Systems (Formerly Cooper Controls) Catalog Numbers: sLRC

2.04 LOW VOLTAGE WALL STATIONS

A. Product: Greengate Digital Switch.

B. Electronics:
   1. Use Eaton Lighting Systems (Formerly Cooper Controls) LCCP or LCCNP wire for low voltage communication wiring for the Greengate Digital Switch.
   2. Use 18 AWG wire for low voltage dry contact switches. Number of conducts is based on type of switch.

C. Functionality:
   1. Upon button press, LEDs to immediately illuminate.
   2. LEDs to reflect the true system status. LED state is programmable to reflect either relay state or button push state.
   3. Allow for easy reprogramming without replacing unit.
   4. Replacement of units does not require reprogramming.

D. Provide faceplates with Low Voltage Wall Stations

E. Engrave wall stations with appropriate button, zone and scene engraving descriptions furnished prior to fabrication.

2.05 LOW VOLTAGE CONTROL INTERFACES

A. Contact Closure
   1. Integral contact closures to accept both momentary and maintained contact closures.
   2. Systems that do not include integral contact closures shall not be acceptable.

B. Serial Interface
   1. Provide ability to communicate by means of serial communication by means of user-supplied PC or digital audiovisual equipment. Control to be located within 50 feet (15 meters) of source.
   2. Communications protocol to provide access to:
      a. Individual Relay Commands
      b. Individual Relay Status
      c. Input Status
      d. Network Override Commands
   3. Provide full programming, monitoring and override control using Keeper Enterprise Programming software.

C. Ethernet Interfaces; Eaton Lighting Systems (Formerly Cooper Controls) Model Ethernet Interface Module
   1. Provide ability to communicate by means of TCP/IP over Ethernet to ControlKeeper lighting control system by means of user-supplied PC or digital audiovisual equipment. Control to be located within 300 feet (100 meters) of Ethernet source.
   2. Communications protocol to provide access to:
      a. Individual Relay Commands
      b. Individual Relay Status
      c. Input Status
      d. Network Override Commands

D. BACnet Interface; Eaton Lighting Systems (Formerly Cooper Controls) Model AIM B NW:
   1. The ControlKeeper® network shall permit data proto-col translation through a building automation interface Gateway. The BACnet Gateway shall permit BACnet communication protocol to operate individual relays, relay groups and read the status of those relays. The ControlKeeper® network shall respond efficiently to the requested information from the BACnet network.
   2. Provide PIC list definition and object model to other system manufacturers.

E. LonWorks Interface; Eaton Lighting Systems (Formerly Cooper Controls) Model AIM L NW:
   1. Provide ability to communicate by means of LonWorks FTT-10 communication to centralized lighting system from user-supplied LonWorks FTT-10 twisted pair network.
   2. The ControlKeeper® network shall permit data protocol translation through a building automation interface Gateway. The LON Gateway shall permit LonWorks communication protocol to operate individual relays, relay groups and read the status of those relays. The ControlKeeper® network shall respond efficiently to the requested information from the LonWorks network.
   3. Provide LonWorks interface object model specification to secondary equipment manufacturers.

2.06 SENSORS

A. Refer Section [260924 – Lighting Control Devices:] Occupancy sensors used in conjunction with the lighting control system.

2.07 ACCESSORIES

A. The ControlKeeper® has several hardware accessories that may be utilized to enhance your lighting control application. Select from the network hardware accessories which accessories will be utilized for your application.
   1. ControlKeeper® TouchScreen (CKT)
      a. The CKT shall provide additional flexibility by providing up to 48 - 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CKT controllers, although accessible through the network, shall be fully stand-alone in their control capability. The CKT provides full status indication of CPU status, network communication, power, and HOA overrides. The controller shall provide thirty-two, 3-wire or 2-wire dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide four analog inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 128 additional global commands for network control and shall reside in the CKT. Networks that rely on a single time clock for system operation shall not be acceptable.

2.08 SOURCE QUALITY CONTROL

A. Perform full-function testing on completed assemblies at end of line. Statistical sampling is not acceptable.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION AND DOCUMENTATION

A. Installation
   1. The control system shall be installed and fully wired as shown on the plans by the installing contractor. The contractor shall complete all electrical connections to all control circuits and override wiring.

B. Documentation
   1. The contractor shall provide accurate “as-built” drawings to the owner for correct programming and proper maintenance of the control system. The “as-builts” shall indicate the load controlled by each relay and the relay panel number.

C. Operation and Service Manuals
   1. The factory shall supply all operation and service manuals.

3.02 PRODUCT SUPPORT AND SERVICE

A. Factory Support
   1. Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of solving programming or application questions concerning the control equipment.

3.03 SYSTEM DELIVERY AND ACCEPTANCE

A. Delivery
   1. The contractor is responsible for complete installation of the entire system according to strict factory standards and requirements. The following items shall constitute factory standards and requirements:
      a. All system equipment shall operate in accordance with specification and industrial standard procedures.
      b. An operational user program shall exist in the control system. The program shall execute and perform all functions required to effectively operate the site according to the requirements.
      c. Demonstration of program integrity during normal operation and pursuant to a power outage.

d. Contractor shall provide a minimum of two training hours on the operation and use of the control system. Additional support services shall be negotiated between the contractor and the building owner or manager.

3.04 FACTORY COMMISSIONING (OPTIONAL)

A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with twenty one working days written notice of the system startup and adjustment date.

C. Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

3.05 WARRANTY

A. Warranty

1. Manufacturer shall supply a 3-year warranty on all hardware and software. A limited 10-year warranty shall be provided on all relay cards. These warranties will be in affect for all installations. Systems that provide special warranties based on installation shall not be acceptable.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 67 - Panelboards; Current Edition, Including All Revisions.

K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

L. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 MAINTENANCE MATERIALS

A. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Schneider Electric; Square D Products; _____: www.schneider-electric.us/#sle.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the short circuit rating provided by utility. Bidding value shall be 22,000 AIC with modification upon confirmation from the utility. .

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum or copper.
   2. Ground Bus Material: Aluminum or copper.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.
   2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Aluminum or copper.
   3. Ground Bus Material: Aluminum or copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating not less than the short circuit rating provided by utility. Bidding value shall be 22,000 AIC with modification upon confirmation from the utility.
   3. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
   6. Provide the following circuit breaker types where indicated:
      a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
      b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
      c. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.

7. Do not use tandem circuit breakers.
8. Do not use handle ties in lieu of multi-pole circuit breakers.
9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
10. Provide the following features and accessories where indicated or where required to complete installation:
    a. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling.

J. Provide grounding and bonding in accordance with Section 26 05 26.

K. Install all field-installed branch devices, components, and accessories.

L. Provide filler plates to cover unused spaces in panelboards.

M. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

N. Provide engraved plastic nameplates under the provisions of Section 26 05 53.

3.02 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 26 32 13
ENGINE GENERATOR

PART 1 GENERAL

1.01 DESCRIPTION OF SYSTEM & SITE

A. Provide a standby power system to supply electrical power at 120/208 Volts, 60 Hertz, 3 Phase. The generator shall consist of a liquid cooled spark-ignited engine, a synchronous AC alternator, and system controls with all necessary accessories for a complete operating system, including but not limited to the items as specified hereinafter.

B. The site is an NEC ordinary location with no specific harsh environment requirements.

C. The genset shall be applied at the listed ambient and elevation. Bidders to submit the generators rated power output at 100 ambient (°F) and 1000 elevation (Ft).

D. Bidders are to submit the genset's sound level in dBA at 23 ft based on the configuration specified.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. An electric generating system, consisting of a prime mover, generator, governor, coupling and all controls, must have been tested, as a complete unit, on a representative engineering prototype model of the equipment to be sold.

B. The generator set must conform to applicable NFPA requirements.

C. The generator set must be available with the Underwriters Laboratories listing (UL2200) for a stationary engine generator assembly.

D. The generator set must be pre-certified to meet EPA federal emission requirements for stationary standby. On-site emission testing & certification will not be acceptable for standby applications.

1.03 MANUFACTURER QUALIFICATIONS

A. This system shall be supplied by an original equipment manufacturer (OEM) who has been regularly engaged in the production of engine-alternator sets, automatic transfer switches, and associated controls for a minimum of 25 years, thereby identifying one source of supply and responsibility. Approved suppliers are: Caterpillar, Cummins and Generac.

B. The manufacturer shall have printed literature and brochures describing the standard series specified, not a one of a kind fabrication.

C. Manufacturer's authorized service representative shall meet the following criteria:
   1. Certified, factory trained, industrial generator technicians
   2. Service support 24/7
   3. Service location within 200 miles
   4. Response time of 4 hours
   5. Service & repair parts in-stock at performance level of 95%
   6. Offer optional remote monitoring and diagnostic capabilities

1.04 SUBMITTALS

A. Engine Generator specification sheet

B. Controls specification sheet(s)

C. Installation / Layout dimensional drawing

D. Wiring schematic

E. Sound data

F. Emission certification

G. Warranty statement

PART 2 ENGINE

2.01 ENGINE RATING AND PERFORMANCE

A. The prime mover shall be a liquid cooled, spark-ignited, 4-cycle engine. It will have adequate horsepower to achieve rated kW output.

B. The engine shall support a 100% load step.

C. The generator system shall support generator start-up and load transfer within 10 seconds.

D. The generator shall accept a load step of 100% of rated kW with a maximum frequency dip of 12 Hz.

E. Performance - Vendors shall size equipment for the following loads and steps. All equipment vendors shall quote equipment that meets performance requirements:

1. Step One Loads:
    a. LED lighting - 120V, single phase, ~14,000W
    b. Lighting Control Panel - 120V, single phase, 500W
    c. Fire Suppression Monitoring System - 120V, single phase, 1000W
    d. General Purpose Receptacles - 120V, single phase, 27,700W
    e. Quantity of 1 - Pressure Washer - 208V, single phase, 5 horsepower
    f. Quantity of 1 - Welder - 208V, single phase, 40A
    g. Quantity of 1 - Vehicle Lift - 208V, single phase, 11A
    h. Quantity of 1 - Refrigerator - 120V, single phase, 1200W
    i. Quantity of 1 - Microwave - 120V, single phase, 1100W
    j. Quantity of 1 - Toaster Oven - 120V, single phase, 1800W
    k. Quantity of 1 - Security/Door System - 120V, single phase, 1000W
    l. Quantity of 1 - Communications Systems - 120V, single phase, 5000W
    m. Quantity of 1 - Exhaust Fans (EF-1) - 120V, single phase, 3/4 horsepower, 13.8A
    n. Quantity of 1 - Exhaust Fan (EF-2) - 208V, three phase, 1-1/2 horsepower, 6.9A
    o. Quantity of 3 - Exhaust Fan (EF-3) - 120V, single phase, 87W each
    p. Quantity of 1 - Exhaust Fan (EF-4) - 120V, single phase 127W each
    q. Quantity of 1 - Gas Water Heaters (GWH-1) - 120V, single phase, 3A
    r. Quantity of 1 - Gas Monitoring/Detection System - 120V, single phase, 500W
    s. Quantity of 1 - Well pump - 230V, single phase, 1 horsepower
    t. Quantity of 3 - Motorized Gates - 230V, single phase, 1 horsepower each
    u. Quantity of 19 - Overhead Motorized Doors - 120V, single phase, 1/2 horsepower each - Calculate with no more than five operating at one time
2. Step Two Loads:
    a. Quantity of 4 - Infrared Tube Heaters (IR-1, IR-2, IR-3 & IR-4) - 120V, single phase, 2.3A each
    b. Quantity of 3 - Gas Fired Unit Heaters (UH-1, UH-2 & UH-3) - 120V, single phase, 10.45A each
    c. Quantity of 2 - Furnaces (F-1 & F-2) - 115V, single phase, 14.4 FLA each
3. Step Three Loads:
    a. Quantity of 2 - Condensing Units (CU-1 & CU-2) - 208V, single phase, 26.4 FLA each
    b. Quantity of 1 - Sewage Ejector - 208V, single phase, 1/2 horsepower
    c. Quantity of 1 - Air Compressor - 208V, single phase, 7.5 horsepower, 40A
    d. Future Fuel Island - (2) 2 horsepower pumps, 50A, 208V, single phase
4. With the above loads the package shall be loaded less than 75% of capacity, maximum frequency dip shall be less than 15 Hz and maximum starting voltage dip shall be 35% or less. Provide generator calculation report when 260010 is submitted.
5. Voltage regulation shall not exceed one percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed +/- 0.5 percent.

6. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.
7. Cooling system shall not derate in the enclosure at temperatures below required 104°F.

2.02 ENGINE OIL SYSTEM

A. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have a replaceable oil filter(s) with internal bypass and replaceable element(s).

B. The engine shall operate on mineral based oil. Synthetic oils shall not be required.

C. Engine Cooling System
1. The engine is to be cooled with a unit mounted radiator, fan, water pump, and closed coolant recovery system. The coolant system shall include a coolant fill box which will provide visual means to determine if the system has adequate coolant level. The radiator shall be designed for operation in 122 degrees F, (50 degrees C) ambient temperature.

D. The engine shall have (a) unit mounted, thermostatically controlled water jacket heater(s) to aid in quick starting. The wattage shall be as recommended by the manufacturer.

E. Engine coolant and oil drain extensions, equipped with pipe plugs and shut-off valves, must be provided to the outside of the mounting base for cleaner and more convenient engine servicing.

F. A radiator fan guard must be installed for personnel safety that meets UL and OSHA safety requirements.

2.03 ENGINE STARTING SYSTEM

A. Starting shall be by a solenoid shift, DC starting system.

B. Engine's cranking batteries shall be lead acid. The batteries shall be sized per the manufacturer's recommendations. The batteries supplied shall meet NFPA 110 cranking requirements of 90 seconds of total crank time. Battery specifications (type, amp-hour rating, cold cranking amps) to be provided in the submittal.

C. The genset shall have an engine driven, battery charging alternator with integrated voltage regulation.

D. The genset shall have an automatic dual rate, float equalize, 10 amp battery charger. The charger must be protected against a reverse polarity connection. The chargers charging current shall be monitored within the generator controller to support remote monitoring and diagnostics. The battery charger is to be factory installed on the generator set. Due to line voltage drop concerns, a battery charger mounted in the transfer switch will be unacceptable.

2.04 ENGINE FUEL SYSTEM

A. The engine shall be configured to operate on pipe line grade natural gas.

B. The engine shall utilize a fuel system inclusive of carburetor, gas regulator, , low gas pressure switch, and fuel shut-off solenoid. Generators larger than 80 kW are to include air-fuel-ratio control.

C. The engines internal fuel connections shall be terminated to the generator frame via an NPT fitting for easy installation.

2.05 ENGINE CONTROLS

A. Engine speed shall be controlled with an integrated isochronous governor function with no change in alternator frequency from no load to full load. Steady state regulation is to be 0.25%.

B. To support EPA emission requirements, gensets larger than 80 kW will incorporate an active air-fuel-ratio controller. The air-fuel-ratio controller shall be integrated into the generator controller to ensure security of settings and to support monitoring and remote diagnostics. External air-fuel-ratio controllers are not acceptable.

C. Engine sensors used for monitoring and control are to be conditioned to a 4-20ma signal level to enhance noise immunity.

D. All engine sensor connections shall be sealed to prevent corrosion and improve reliability.

E. Engine Exhaust & Intake
   1. The engine exhaust emissions shall meet the EPA emission requirements for standby power generation.

F. For generators larger than 80 kW, the engine will incorporate a 3-way catalytic convertor to meet EPA emission requirements.

G. The manufacturer shall supply its recommended stainless steel, flexible connector to couple the engine exhaust manifold to the exhaust system. A rain cap will terminate the exhaust pipe after the silencer. All components must be properly sized to assure operation without excessive back pressure when installed.

H. The manufacturer shall supply a critical grade exhaust silencer as standard. For applications with site specific sound requirements (reference section 1.1), the silencer shall be selected to achieve site sound levels.

I. For gensets in a weather or sound attenuated enclosure, all exhaust piping from the turbo-charger discharge to the silencer shall be thermally wrapped to minimize heat dissipation inside the enclosure.

J. The engine intake air is to be filtered with engine mounted, replaceable, dry element filters.

2.06 ALTERNATOR

A. The alternator shall be the voltage and phase configuration as specified in section 1.1.1.

B. The alternator shall be a 4-pole, revolving field, stationary armature, synchronous machine. The excitation system shall utilize a brushless exciter with a three phase full wave rectifier assembly protected against abnormal transient conditions by a surge protector. Photo-sensitive components will not be permitted in the rotating exciter.

C. The alternator shall include a permanent magnet generator (PMG) for excitation support. The system shall supply a minimum short circuit support current of 300% of the rating (250% for 50Hz operation) for 10 seconds.

D. The alternator shall support 299 skVA with a maximum voltage dip of 30 %.

E. Three phase alternators shall be 12 lead, broad range capable of supporting voltage reconnection. Single phase alternators shall be four lead and dedicated voltage designs (600v) shall be six lead. All leads must be extended into a NEMA 1 connection box for easy termination. A fully rated, isolated neutral connection must be included by the generator set manufacturer.

F. The alternator shall use a single, sealed bearing design. The rotor shall be connected to the engine flywheel using flexible drive disks. The stator shall be direct connected to the engine to ensure permanent alignment.

G. The alternator shall meet temperature rise standards of UL2200 (120 degrees C). The insulation system material shall be class "H" capable of withstanding 150 degrees C temperature rise.

H. The alternator shall be protected against overloads and short circuit conditions by advanced control panel protective functions. The control panel is to provide a time current algorithm that protects the alternator against short circuits. To ensure precision protection and repeatable trip characteristics, these functions must be implemented electronically in the generator control panel -- thermal magnetic breaker implementation are not acceptable.

2.07 CONTROLS

A. The generator control system shall be a fully integrated microprocessor based control system for standby emergency engine generators meeting all requirements of NFPA 110 level 1.

B. The generator control system shall be a fully integrated control system enabling remote diagnostics and easy building management integration of all generator functions. The generator controller shall provide integrated and digital control over all generator functions including: engine protection, alternator protection, speed governing, voltage regulation, air-fuel-

ratio control (as required) and all related generator operations. The generator controller must also provide seamless digital integration with the engine's electronic engine control module (ECM) if so equipped. Generator controller's that utilize separate voltage regulators and speed governors or do not provide seamless integration with the engine management system are considered less desirable.

C. Communications shall be supported with building automation via the Modbus protocol without network cards. Optional internet and intranet connectivity shall be available.

D. The control system shall provide an environmentally sealed design including encapsulated circuit boards and sealed automotive style plugs for all sensors and circuit board connections. The use of non-encapsulated boards, edge cards, and pc ribbon cable connections are considered unacceptable.

E. Circuit boards shall utilize surface mount technology to provide vibration durability. Circuit boards that utilize large capacitors or heat sinks must utilize encapsulation methods to securely support these components.

F. A predictive maintenance algorithm that alarms when maintenance is required. The controller shall have the capability to call out to the local servicing dealer when maintenance is required.

G. Diagnostic capabilities should include time-stamped event and alarm logs, ability to capture operational parameters during events, simultaneous monitoring of all input or output parameters, callout capabilities, support for multi-channel digital strip chart functionality and .2 msec data logging capabilities.

H. In addition to standard NFPA 110 alarms, the application loads should also be protected through instantaneous and steady state protective settings on system voltage, frequency, and power levels.

I. The control system shall provide pre-wired customer use I/O: 4 relay outputs (user definable functions), communications support via RS232, RS485, or an optional modem. Additional I/O must be an available option.

J. Customer I/O shall be software configurable providing full access to all alarm, event, data logging, and shutdown functionality. In addition, custom ladder logic functionality inside the generator controller shall be supported to provide application support flexibility. The ladder logic function shall have access to all the controller inputs and customer assignable outputs.

K. The control panel will display all user pertinent unit parameters including: engine and alternator operating conditions; oil pressure and optional oil temperature; coolant temperature and level alarm; fuel level (where applicable); engine speed; DC battery voltage; run time hours; generator voltages, amps, frequency, kilowatts, and power factor; alarm status and current alarm(s) condition per NFPA 110 level 1.

2.08 ENGINE / ALTERNATOR PACKAGING

A. The engine/alternator shall be mounted with internal vibration isolation onto a welded steel base. These units shall not need external vibration isolation for normal pad mounted applications.

B. A mainline, thermal magnetic circuit breaker carrying the UL mark shall be factory installed. The breaker shall rated between 100 to 125% of the rated ampacity of the genset. The line side connections are to be made at the factory. Output lugs shall be provided for load side connections.

C. The generator shall include a unit mounted 120 volt convenience outlet.

2.09 ENCLOSURE

A. The genset shall be packaged with a sound attenuating enclosure.

B. The enclosure shall be completely lined with sound deadening material. This material must be of a self extinguishing design.

C. The enclosure shall be made of steelwith a minimum thickness of 14 gauge. The enclosure is to have hinged, removable doors to allow access to the engine, alternator and control panel.

The hinges shall allow for door fit adjustment. Hinges and all exposed fasteners will be stainless steel or JS5000. The use of pop-rivets weakens the paint system and not allowed on external painted surfaces. Each door will have lockable hardware with identical keys.

D. The enclosure shall be coated with electrostatic applied powder paint, baked and finished to manufacturer's specifications. The color will be manufacturer's standard. The enclosure shall utilize an upward discharging radiator hood. Due to concerns relative to radiator damage, circulating exhaust, and prevailing winds, equipment without a radiator discharge hood will not be acceptable.

E. The genset silencer shall be mounted on the discharge hood of the enclosure. Due to architectural concerns, silencers mounted on the top of the generator enclosure are not acceptable. Gensets with silencers mounted inside the main generator compartment are acceptable only if the silencer is thermally wrapped to minimize heat stress on the surrounding components.

2.10 LOOSE ITEMS

A. Supplier to itemize loose parts that require site mounting and installation. Preference will be shown for gensets that factory mount items like mufflers, battery chargers, etc.

B. Flexible fuel hose for use in gas piping installation.

C. Spare Parts:
   1. Fuses: One spare set
   2. Filters One spare set (air, fuel, oil)

D. Provide an NFPA 110/99 compliant alarm annunciator panel for remote indication. The panel shall have an ALARM switch that when moved to the OFF position silences the audible alarm. A TEST/RESET switch must be included to verify the lights are functional and reset any condition after it has cleared Then annunciator shall be controlled using RS485 communications from the generator controller. Annunciators requiring individual contacts and wires per indication point are not preferred.

E. Provide a remote emergency stop station for location inside the facility.

PART 3 ADDITIONAL PROJECT REQUIREMENTS

3.01 FACTORY TESTING

A. Before shipment of the equipment, the engine-generator set shall be tested under rated load for performance and proper functioning of control and interfacing circuits. Tests shall include:
   1. Verify voltage & frequency stability.
   2. Verify transient voltage & frequency dip response.
   3. Load test the generator for 30 minutes.

3.02 OWNER'S MANUALS

A. Three (3) sets of owner's manuals specific to the product supplied must accompany delivery of the equipment. General operating instruction, preventive maintenance, wiring diagrams, schematics and parts exploded views specific to this model must be included.

3.03 INSTALLATION

A. Contractor shall install the complete electrical generating system including all external fuel connections in accordance with requirements of NEC, NFPA, and the manufacturer's recommendations as reviewed by the Engineer.

3.04 SERVICE

A. Supplier of the genset and associated items shall have permanent service facilities in this trade area. These facilities shall comprise a permanent force of factory trained service personnel on 24 hour call, experienced in servicing this type of equipment, providing warranty and routine maintenance service to afford the owner maximum protection. Delegation of this service responsibility for any of the equipment listed herein will not be considered fulfillment of these specifications. Service contracts shall also be available.

3.05 WARRANTY

A. The standby electric generating system components, complete genset and instrumentation panel shall be warranted by the manufacturer against defective materials and factory workmanship for a period of five (5) years. Such defective parts shall be repaired or replaced at the manufacturer's option, free of charge for parts, labor and travel.

B. The warranty period shall commence when the standby power system is first placed into service. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents must be provided. Also, in the judgment of the specifying authority, the manufacturer supplying the warranty for the complete system must have the necessary financial strength and technical expertise with all components supplied to provide adequate warranty support.

3.06 STARTUP AND CHECKOUT

A. The supplier of the electric generating plant and associated items covered herein shall provide factory trained technicians to checkout the completed installation and to perform an initial startup inspection to include:
   1. Ensuring the engine starts (both hot and cold) within the specified time.
   2. Verification of engine parameters within specification.
   3. Verify no load frequency and voltage, adjusting if required.
   4. Test all automatic shutdowns of the engine-generator.
   5. Perform a load test of the electric plant, ensuring full load frequency and voltage are within specification by using building load.
   6. Perform a 4 hour load test per the acceptance requirements of NFPA110.

3.07 TRAINING

A. Training is to be supplied by the start-up technician for the end-user during commissioning. The training should cover basic generator operation and common generator issues that can be managed by the end-user. The equipment supplier shall provide a minimum of two hours of training for operating personnel at the time of equipment start up. The equipment distributor shall include a second dedicated on site training program in the first six months for site personnel. Training program shall be not less than 2 hours in duration with class size limited to 5 persons. Second training date shall be coordinated with the Owner. Training shall be performed by the Equipment Distributor's full time field service technician. Training shall cover generator set package operation and maintenance.

3.08 COMPLIANCE

A. **GENERATOR WILL ALSO NEED TO MEET "USEPA CERTIFICATION OF CONFORMITY WITH NSPS SUBPART IIII", AND COMPLY WITH "RICE EMISSION STANDARDS". DOCUMENTATION INCLUDING MANUFACTURER'S EMISSION RATES, TO SUPPORT THIS MUST BE PROVIDED AT TIME OF BID FOR MANUFACTURER TO BE ACCEPTED.**

3.09 ADDITIVE ALTERNATE #E1

A. Provide pricing for a standard 5 year planned generator maintenance agreement.

END OF SECTION

SECTION 26 36 00
AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install automatic transfer switches (3ATS) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Each automatic transfer shall consist of an inherently double throw power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

1.02 ACCEPTABLE MANUFACTURERS

A. Automatic transfer switches shall be ASCO Series 300 (3ATS). Any alternate shall be submitted to the consulting engineer in writing at least 10 days prior to bid. Each alternate bid must list any deviations from this specification.

1.03 CODES AND STANDARDS

A. The automatic transfer switches and accessories shall conform to the requirements of:
   1. UL 1008 - Standard for Automatic Transfer Switches
   2. CSA C22.2 No.178 – 1978
   3. NFPA 70 - National Electrical Code
   4. NFPA 99 – Health Care Facilities
   5. NFPA 110 - Emergency and Standby Power Systems
   6. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
   7. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
   8. NEC Articles 700, 701, 702
   9. International Standards Organization ISO 9001: 2008
   10. IEC 60947 – 6 – 1

PART 2 PRODUCTS

2.01 MECHANICALLY HELD TRANSFER SWITCH

A. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include over current disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

C. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.

D. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

E. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

F. Where neutral conductors must be switched, the ATS shall be provided with fully-rated neutral transfer contacts.

G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

2.02 GROUP 'G' CONTROLLER WITH INTEGRATED USER INTERFACE PANEL

A. A. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.

B. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, inherent serial communications capability, and the ability to communicate via the Ethernet through optional communications module

C. A single controller shall provide single and three phase capability for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to ± 1% of nominal voltage. Frequency sensing shall be accurate to ± 0.1Hz. Time delay settings shall be accurate to ± 0.5% of the full scale value of the time delay. The panel shall be capable of operating over a temperature range of -20 to + 70 degrees C, and storage from -55 to + 85 degrees C.

D. The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards.

E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
   1. IEEE C37.90
   2. IEC 60947 – 6 - 1, 61000-4
      a. IEC 61000 – 4 - 2 Electrostatic Discharge Immunity
      b. IEC 61000 – 4 - 3 Radiated RF Field Immunity
      c. IEC 61000 – 4 - 4 Electrical Fast Transient/Burst Immunity
      d. IEC 61000 – 4 - 5 Surge Immunity
      e. IEC 61000 – 4 – 6 Conducted RF Immunity
   3. CISPR 11 – Conducted RF Emissions and Radiated RF Emissions

2.03 ENCLOSURE

A. The 3ATS shall be furnished in a NEMA type 1 enclosure unless otherwise shown on the plans.

B. Controller shall be mounted on, visable, and operational through enclosure door.

PART 3 OPERATIONS

3.01 CONTROLLER DISPLAY AND KEYPAD

A. A 128*64 graphical LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through communications port. The following parameters shall only be adjustable via DIP switches on the controller.
   1. Nominal line voltage and frequency
   2. Single or three phase sensing on normal, and single phase sensing on emergency
   3. Transfer operating mode configuration, (open transition, or delayed transition)
   4. All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

3.02 VOLTAGE AND FREQUENCY SENSING

A. A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup,dropout, and trip settings capabilities (values shown as % of nominal unless otherwise specified.

	Parameter	Sources	Dropout/Trip	Pickup/Reset
1.				
2.	Undervoltage	N & E	70 to 98%	85 to 100%
3.	Overvoltage	N & E	102 to115%	2% below trip

4.	Undervoltage	N & E	85 to 98%	90 to 100%
5.	Overfrequency	N & E	102 to 110%	2% bellow trip

B. Repetitive accuracy of all settings shall be within 1% at +25C

C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.

D. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases, and frequency.

E. The backlit 128*64 graphical display shall have multiple language capability.
   1. Languages can be selected from the user interface.

3.03 TIME DELAYS

A. A time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals, adjustable 0 to 6 seconds. It shall be possible to bypass the time delay from the controller user interface.

B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes 59 seconds for controlled timing of transfer of loads to emergency. It shall be possible to bypass the time delay from the controller user interface.

C. A generator stabilization time delay shall be provided after transfer to emergency adjustable 0 or 4 seconds.

D. A time delay shall be provided on retransfer to normal, adjustable 0 to 9 hours 59 minutes 59 seconds. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.

E. A cooldown time delay shall be provided on shutdown of engine generator,Adjustable 0 to 60 minutes 59 seconds.

F. All adjustable time delays shall be field adjustable without the use of special tools.

G. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minutes 59 seconds time delay in any of the following modes:
   1. Prior to transfer only.
   2. Prior to and after transfer.
   3. Normal to emergency only.
   4. Emergency to normal only.
   5. Normal to emergency and emergency to normal.
   6. All transfer conditions or only when both sources are available.

H. In the event that the alternate source is not accepted within the configured Failure to Accept time delay, the common alert indication shall become active.

3.04 ADDITIONAL FEATURES

A. The user interface shall be provided with test/reset modes. The test mode will simulate a normal source failure. The reset mode shall bypass the time delays on either transfer to emergency or retransfer to normal.

B. A set of contacts rated 2 amps, 30 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down. setting, regardless of whether the normal source restores before the load is transferred.

C. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact closed when the ATS is connected to the emergency source.

D. A single alarm indication shall light up the alert indicator and de – energize the configured common alarm output relay for external monitoring.

E. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).

F. LED indicating lights shall be provided and energized by controller outputs. Thelights shall provide true source availability of the normal (green) and emergency (red) source, as determined by the voltage sensing trip and reset settings for each source.

G. LED indicating light shall be provided to indicate switch not in automatic mode (manual); and blinking (amber) to indicate transfer inhibit.

H. LED indicating light shall be provided to indicate any alarm condition or active time delay (red).

I. The following features shall be built – in to the controller, but capable of being activated through keypad programming or the serial port only when required by the user:
   1. Provide the ability to select “commit/no commit to transfer” to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
   2. A variable window inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer. The inphase monitor shall be equal to ASCO feature 27.
   3. An engine generator exercising timer shall be provided to configure weekly and bi-weekly automatic testing of an engine generator set with or without load for 20 minutes fixed. It shall be capable of being configured to indicate a day of the week, and time weekly testing should occur.

J. The following feature shall be built – into the controller, but capable of being activated through keypad programming,communications interface port, or additional hardware.
   1. Terminals shall be provided for a remote contact to signal the ATS to transfer to emergency. This inhibit signal can be enabled through the keypad or serial port.

K. System Status - The controller LCD display shall include a “System Status” screen which shall be readily accessible from any point in the menu by depressing the “ESC” key. This screen shall display a clear description of the active operating sequences and switch position. For example,
   1. Normal Failed
   2. Load on Normal
   3. TD Normal to Emerg
   4. 2min15s
   5. Controllers that require multiple screens to determine system status or display “coded” system status messages, which must be explained by references in the operator’s manual are not permissible.

L. Self Diagnostics – The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.

M. Communications Interface – The controller shall be capable of interfacing, through an optional serial communication port with a network of transfer switches, locally (up to 4000 ft.). Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control, and setup of parameters.

N. Data Logging – The controller shall have the ability to log data and to maintain the last 300 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non – volatile memory.
   1. Event Logging
      a. Data and time and reason for transfer normal to emergency
      b. Data and time and reason for transfer emergency to normal
      c. Data and time and reason for engine start

d. Data and time engine stopped
e. Data and time emergency source available
f. Data and time emergency source not available

2. Statistical Data
   a. Total number of transfers
   b. Total number of transfers due to source failure
   c. Total number of day's controller is energized
   d. Total number of hours both normal and emergency sources are Available
   e. Total time load is connected to normal
   f. Total time load is connected to emergency
   g. Last engine start
   h. Last engine start up time
   i. Input and output status

3.05 OPTIONAL FEATURES TO INCLUDE

A. Accessory Package - An accessory bundle shall be provided that includes:
   1. A fully programmable engine exerciser with seven independent routines to exercise the engine generator, with or without load on a daily weekly, bi – weekly, or monthly basis.
   2. Event log display that shows event number, time and date of events, event type, and reason (if applicable). A minimum of 300 events shall be stored.
   3. RS – 485 communications port enabled.
   4. Common alarm output contact.
      a. This feature shall be equal to ASCO accessory 11BE, and shall be capable of being activated for existing switches through optional accessory dongle).

B. Current Sensing Card - A load current metering card shall be provided that measures either single or three phase load current. It shall include current transformers (CT's) and shorting block. Parameters shall be able to be viewed via the user interface. (This feature shall be equal to ASCO accessory 23GA (single phase), 23GB (three phase), and shall be capable of being added to existing switches without modification).

C. Communication Interface - A Quad – Ethernet module shall be provided to allow several different serial devices that communicate at different baud rates and with different protocols to a common Ethernet media. The module shall be used to connect Series 300 and ASCO ATS Annunciators to the standard Ethernet network. It shall include (2) RJ – 45, (2) RS – 485, (2) TTL, and (2) CAN ports. The module shall be designed to communicate with multiple clients such as Web Browsers, and PowerQuest® systems simultaneously over the Ethernet connection. (This feature shall be equal to ASCO accessory 72EE, and shall be capable of being added to existing switches without modification).

PART 4 ADDITIONAL REQUIREMENTS

4.01 WITHSTAND AND CLOSING RATINGS

A. The ATS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. WCR ATS ratings shall be as follows when used with specific circuit breakers:

1. ATS Size	Withstand & Closing Rating MCCB (480v/60hz)	W/CLF
a. 30	10,000A	100,000
b. 70 - 200	22,000A	200,000
c. 230	22,000A	100,000
d. 260 – 400	42,000A	200,000
e. 600	50,000A	200,000
f. 800 – 1200	65,000A	200,000
g. 1600 – 2000	85,000A	200,000
h. 2600 – 3000	100,000A	200,000

4.02 TESTS AND CERTIFICATION

A. The complete 3ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.

B. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

C. The ATS manufacturer shall be certified to ISO 9001: 2008 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001: 2008.

4.03 SERVICE REPRESENTATION

A. The ATS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

B. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

C. For ease of maintenance, the transfer switch nameplate shall include drawing numbers and serviceable part numbers.

4.04 WARRANTY

A. The automatic transfer switch shall be warranted by the manufacturer against defective materials and factory workmanship for a period of five (5) years. Such defective parts shall be repaired or replaced at the manufacturer’s option, free of charge for parts, labor and travel.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Exit signs.

C. Ballasts and drivers.

D. Accessories.

1.02 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

D. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 101 - Life Safety Code; 2015.

I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

J. UL 1598 - Luminaires; Current Edition, Including All Revisions.

K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings. For voluntary alternates, see Section 26 00 10.

2.02 LUMINAIRES

A. Provide products that are listed and labeled as complying with UL 1598, where applicable.

B. Provide products that comply with requirements of NFPA 70 and NFPA 101.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EXIT SIGNS

A. Description: Exit signs and similar signs for special purpose applications such as area of refuge/rescue assistance.

B. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

C. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
   1. Self-Powered Exit Signs:
      a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
      b. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
      c. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
   4. Secure pendant-mounted luminaires to building structure.
   5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

H. Suspended Luminaires:
   1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   2. Install canopies tight to mounting surface.
   3. Unless otherwise indicated, support pendants from swivel hangers.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Lighting in equipment rooms and electric closets is diagrammatic, indicating type, quantity and general circuiting of fixtures. Modify locations and mounting to suit conditions, allowing clearances for equipment, piping and ductwork.

K. Install accessories furnished with each luminaire.

L. Bond products and metal accessories to branch circuit equipment grounding conductor.

M. Interface with air handling accessories.

N. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

O. Remote Ballasts: Install in concealed and accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.

P. Install lamps in each luminaire.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

F. New light fixtures SHALL NOT be used as temporary lighting. Once they are installed, test for proper installation, then leave off until ready to turn over to owner. Maintain temporary lighting throughout entire project.

3.03 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Engineer or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Engineer or authority having jurisdiction.

3.04 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

3.06 PROTECTION

A. Relamp luminaires that have failed lamps at Substantial Completion.

3.07 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

1.02 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

D. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

E. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 1598 - Luminaires; Current Edition, Including All Revisions.

H. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

B. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 EXTRA MATERIALS

A. Furnish two gallons of touch-up paint.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in Schedule included on the Drawings. For voluntary alternates, see Section 26 00 10.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 POLES

A. Manufacturers: Furnish products as indicated in Schedule included on the Drawings. For voluntary alternates, see Section 26 00 10.

B. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Pole-Mounted Luminaires:
   1. Foundation-Mounted Poles:
      a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.
         1) Install anchor bolts plumb per template furnished by pole manufacturer.
         2) Position conduits to enter pole shaft.
      b. Install foundations plumb.
      c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      d. Tighten anchor bolt nuts to manufacturer's recommended torque.
   2. Grounding:
      a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

3.03 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

B. Aim and adjust luminaires to provide illumination levels and distribution indicated on Drawings.

3.04 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

3.06 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 26 60 50

TELEPHONE, TELEVISION AND DATA SYSTEMS' RACEWAYS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section of the specification indicates the scope of the work for the Wolverine Power Supply Cooperative, Inc. - Service Center Building Project contract.

B. The Telephone, Television and Data Cabling raceway system shall include, but not be limited to, the following:
   1. Complete raceway system including conduit as indicated on the drawings.
   2. Provide all electrical power outlets as indicated on the drawings.
   3. Installation of the raceway system shall be closely coordinated with the Contractor performing the wiring and termination of the Telephone, Television and Data Cabling systems. The electrical contractor for the Wolverine Power Supply Cooperative, Inc. - Service Center Building Contract shall provide any miscellaneous power and raceway system work required to complete the raceway system to facilitate installation of the Telephone, Television and Data Cabling system.

C. The Telephone, Television and Data Cabling System components will be provided under a separate contract.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 26 60 51
SECURITY SYSTEM RACEWAYS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. This section of the specification indicates the scope of the work for the Wolverine Power Supply Cooperative, Inc. - Service Center Building Project contract.

B. The Security Cabling raceway system shall include, but not be limited to, the following:
   1. Complete raceway system including conduit as indicated on the drawings.
   2. Provide all electrical power outlets as indicated on the drawings.
   3. Installation of the raceway system shall be closely coordinated with the Contractor performing the wiring and termination of the Security Cabling systems. The electrical contractor for the Wolverine Power Supply Cooperative, Inc. - Service Center Building Contract shall provide any miscellaneous power and raceway system work required to complete the raceway system to facilitate installation of the Security Cabling system.

C. The Security Cabling System components will be provided under a separate contract.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 28 31 02
FIRE SUPPRESSION MONITORING SYSTEM

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the Contract Documents, including the General and Supplementary General Condition and Division 1 - General Requirements shall apply to the work of this section.

B. At the time of bid, all exceptions taken to these Specifications, all variances from these Specifications and all substitutions of operating capabilities or equipment called for in these Specifications shall be listed in writing and forwarded to the Engineer. Any such exception, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.

C. **The installing company shall prepare and submit appropriate plans and documentation for fire alarm protection supervisory plan review(s) to the Authority(ies) Having Jurisdiction. All associated plan review fees shall be included.**

1.02 SCOPE

A. The work covered by this Section of the Specification shall include all labor, equipment, materials and services to furnish and install fire suppression monitoring system. It shall be complete with all necessary hardware, software, memory and monitoring equipment for an off-site central monitoring agency. The system shall consist of, but not be limited to, the following:
   1. Remote Annunciator.
   2. Interface with fire suppression system(s).
   3. Monitoring equipment.
   4. Manual pull station.

1.03 APPLICABLE CODES AND STANDARDS

A. All equipment shall be UL listed for its intended use.

B. NFPA Standards 72 and 101.

C. The National Electric Code 2011.

D. All other local codes and authorities having jurisdiction.

1.04 RELATED DOCUMENTS

A. Secure permits and approvals prior to installation.

B. Prior to commencement and after completion of work, notify authorities having jurisdiction.

C. Submit letter of approval for installation before requesting acceptance of system.

1.05 RELATED WORK

A. Section 21 12 00 - Fire Suppression Standpipes

B. Section 21 13 00 - Fire Suppression Sprinklers

1.06 SUBMITTALS

A. Provide list of all types of equipment and components provided.

B. Provide description of operation of the system, similar to that provided in Part 2 of this Section of the Specifications, to include any and all exceptions, variances or substitutions listed at the time of bid. Any such exceptions, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.

C. Provide manufacturer's printed product data, catalog cuts and description of any special installation procedures.

D. Provide samples of various items when requested.

E. Provide shop drawings as follows:
   1. Drawing of the remote annunciator.
   2. Single line riser diagram showing all equipment and type, number and size of all conductors.

1.07 WARRANTY

A. Manufacturer shall guarantee the system equipment for a period of one (1) year from date of final acceptance of the system.

B. The contractor shall guarantee all wiring and raceways to be free from inherent mechanical or electrical defects for one (1) year from date of final acceptance of the system.

C. Upon completion of the installation of fire alarm system equipment, the electrical contractor shall provide to the architect a signed written statement, substantially in form as follows: "The undersigned, having engaged as the Electrical Contractor on the Wolverine Power Service Cooperative's Service Center project in Dorr, Michigan confirms that the smoke detection equipment was installed in accordance with the wiring diagrams, instructions and directions provided to us by the manufacturer."

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The catalog numbers used are those of Edwards Systems Technology (EST), and constitute the type and quality of equipment to be furnished.

B. If equipment of another manufacturer is to be submitted for approval as equal, the contractor shall, at the time of bid, list all exceptions taken to these Specifications, all variances from these Specification and all substitutions of operating capabilities or equipment called for in these Specifications and forward said list to the Engineer. Any such exceptions, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment. Final determination of compliance with this Specification shall rest with the Engineer, who, at his discretion, may require proof of performance.

PART 3 EXECUTION

3.01 INSTALLATION

A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagram. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the manufacturer, approved by the local Fire Department, and shall be installed in accordance with NEC requirements for power limited systems (Article 760).

B. All penetration of floor slabs and fire walls shall be fire stopped in accordance with all local fire codes.

C. End of Line Resistors shall be furnished as required for mounting as directed by the manufacturer.

D. All wiring shall be color coded throughout, to National Electrical Code standards. Install plenum rated cable where noted on the drawings.

E. The system shall be arranged to receive power from one three wire 120Vac, 20 A supply. All low voltage operation shall be provided from the fire alarm control panel.

3.02 FIELD QUALITY CONTROL

A. The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the function as specified.

3.03 TESTS

A. Reports of any field testing during installation shall be forwarded to the Engineer.

B. Each individual system operation on a circuit by circuit basis shall be tested for its complete operation. The procedure for testing the entire smoke detection system shall be set forth with the consent of the code enforcement official, the Engineer and the manufacturer.

3.04 DOCUMENTATION AND TRAINING

A. The contractor shall compile and provide to the owners three (3) complete manuals on the completed system to include operating and maintenance instruction, catalog cuts of all equipment and components, as-built wiring diagrams and a manufacturer's suggested spare parts list.

B. In addition to the above manuals, the contractor shall provide the services of the manufacturer's trained representative for a period of two (2) hours to instruct the owners designated personnel on the operation and maintenance of the entire system.

END OF SECTION

SECTION 31 10 00 SITE CLEARING

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Site Demolition: Section 02 41 00 “Demolition”

B) Soil Materials: Section 31 20 00 “Earth Moving”

C) Dewatering: Section 31 20 00 “Earth Moving”

D) Excavation Support and Protection: Section 31 20 00 “Earth Moving”

E) Mulch Blankets: Section 32 90 00 “Planting”

1.2 REFERENCES

A) ASTM (ASTM International)

(1) D4491 “Standard Test Methods for Water Permeability of Geotextiles by Permittivity”

B) State of Michigan

(1) Part 91 of Act 451 of the Public Acts of 1994 (Natural Resources and Environmental Protection Act), “Soil Erosion and Sedimentation Control Act” (SESCA)

1.3 SUBMITTALS

A) All submittals shall be submitted to the Owner for approval a minimum of 15 days prior to commencement of all construction or demolition activities unless otherwise noted.

B) Submit Product Data

(1) Silt Fencing.

C) Submit a sequence and approximate schedule of construction and demolition activities that will provide the owner continuous use of facilities from existing to proposed. This shall include, but is not limited to, utility connections, temporary staging, and cleanup.

D) Submit a plan drawing clearly indicating all trees, shrubs, and ground cover to be removed as well as those which are to be protected.

(1) Indicate method of tree and landscape protection proposed for use.

(2) Indicate the location of topsoil storage, including the method proposed for confinement and protection of stripped or disturbed top soils.

(3) Indicate the extent of silt fencing proposed and any other erosion control and temporary soil retainage measures proposed, if different than indicated on the drawings.

1.4 QUALITY ASSURANCE

A) Comply with the “Soil Erosion and Sedimentation Control Act” and other state and local codes that govern soil disruption and dewatering activities.

B) Avoid interference with adjoining public and private properties during site clearing operations.

(1) Do not close or obstruct public rights-of-way without prior written approval from Authorities Having Jurisdiction.

(2) Do not close or obstruct existing facility access without prior written approval from the Owner.

(3) Provide alternate routes where roads, drives, walkways, and similar means of circulation are obstructed.

(4) Control dust generated at the site and prevent the spread of dust to adjacent properties and rights-of-way.

C) Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 PRODUCTS

2.1 MATERIALS

A) Silt Fencing: Geotextile filter fabric of woven or non-woven polypropylene or polyester fibers, or combination of both.

(1) Flow Rate: 110 to 330 gallons per minute per square foot, per ASTM D4491.

(2) Style: Flat sheet.

(3) Use wood stakes for fastening fabric in accordance with the fabric manufacturer's instructions.

(4) Approved Product: Applied Polymer Systems, Inc., "Silt Stop", or approved equal.

B) Silt Fencing: Geotextile filter fabric of woven, 100 percent biodegradable, natural fibers.

(1) Flow Rate: 110 to 330 gallons per minute per square foot, per ASTM D4491.

(2) Style: Flat sheet.

(3) Use recycled, untreated wood stakes for fastening fabric in accordance with the fabric manufacturer's instructions.

(4) Approved Product: North American Green, Inc., "BioNet," or approved equal.

C) Root Control Barrier: Mechanical barrier and root deflector to contain tree roots, protecting them from construction-related activities and preventing them from damaging adjacent landscaping and constructions.

(1) Approved Product: DeepRoot US, tree root barrier materials as applicable to the types of plant/tree roots being controlled, or approved equal.

PART 3 EXECUTION

3.1 PREPARATION

A) Field-verify all existing benchmarks, boundaries, grades, lines, buildings, curbs, utilities, manholes, wells, hydrants, fences, trees, and other site features.

B) Clearly mark trees and vegetation to be relocated or removed in advance of removal, allowing ample time for the Owner's on-site review and approval of such trees.

(1) Do not proceed with tree and vegetation removal until Owner's approval has been obtained.

C) Protect existing site improvements to remain (including lawns, landscape plantings, and trees, as well as constructed improvements) from damage during demolition and construction.

(1) Prior to demolition and construction, document (by photographs, written descriptions, and/or drawings as appropriate) the condition of existing site improvements slated to remain.

(2) When required to provide access to new work areas, temporarily relocate site improvements.

(3) Provide complete replacement of damaged and relocated site improvements to a condition equal to or better than their condition prior to the start of demolition and construction.

D) Coordinate subsurface and above-ground utility work with the Owner and appropriate utility companies and local municipal Authorities Having Jurisdiction prior to construction.

(1) Locate, identify, disconnect, and seal or cap off existing utilities to be removed.

(2) Place markers at terminated utilities and document in Record Drawings.

(3) Protect existing utilities to remain.

(4) Do not interrupt existing utility services prior to obtaining the Owner's and the utility company's approval.

E) Notify "Miss Dig" at least 3 working days prior to subsurface excavation or construction.

(1) Telephone Number: (800-482-7171).

F) Prior to commencement of clearing, demolition, or construction activities, obtain and pay for soil erosion permit.

3.2 TEMPORARY EROSION AND SEDIMENTATION 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.

(1) Place silt fencing prior to disturbance of existing earth.

(2) Install silt fencing per manufacture's specifications.

B) Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C) After completion of site work and permanent vegetation has been established, remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

(1) Prepare soil with topsoil, seed, and fertilizer.

(2) Provide mulch blanket on all slopes of 1(rise) to 3(run) or steeper, that are disturbed during construction. Install in accordance with the manufacturer's installation instructions.

3.3 TREE PROTECTION

A) Provide protection by fencing, or other appropriate means, for trees and other existing landscape features slated to remain.

(1) Replace or reimburse the Owner for the full value of existing-to-remain trees, shrubs, ground covers, and other landscape features damaged during clearing, demolition, or construction.

B) Do not prune or trim existing trees or shrubs slated to remain without the express approval of the Owner and Engineer.

C) Where construction is to occur within the drip line of a tree or shrub slated to remain, place the protection fencing no further than five feet from the edge of the work, protecting a minimum of two thirds (2/3) of the shrub's or tree's drip line.

D) Where walls, footings, or curbs are to be built within six feet of the trunk of any tree slated to remain, provide a root control barrier between the tree and the wall or curb and extending from the ground surface to a level equal to the bottom of the new structure.

E) Cut roots encountered in trenches and excavations cleanly, providing root sealant for roots over four inches in diameter.

3.4 SITE CLEARING AND GRUBBING

A) Completely remove all organic material, trees, and brush from building foundation and pavement areas.

(1) Remove only those trees specifically approved for removal by the Owner.

(2) Remove stumps, roots, brush, and rocks in areas to receive new site or building Work.

(3) Use only hand methods for grubbing within tree protection zones and areas where existing utilities are present.

(4) Fill depressions caused by clearing and grubbing operations with satisfactory soil material and compact in place, unless further excavation or earthwork is indicated.

(5) Do not burn materials on the Site unless owner approval and local, state and federal requirements are met.

B) Remove and stockpile all usable topsoil on the Project site. If there is excess topsoil that will not be used in the restoration of the site, excess topsoil will be stockpiled, on site, at a location designated by the Owner. Excess topsoil pile will be seeded and mulched for stabilization.

(1) Remove and separate sod, grass, roots, rocks, trash, and other debris from topsoil.

(2) Protect from erosion due to wind or water.

(3) Re-distribute same topsoil to a depth of 4 inches at the proper time in preparation for landscape work.

C) Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off the Owner's property.

D) Remove existing above- and below-grade improvements as required to facilitate new construction.

E) Relocate trees, shrubs, and other landscape features interfering with construction to suitable new locations on site as directed by the Owner.

F) All salvageable materials shall become the property of the contractor, unless otherwise indicated by the owner, and shall be removed from the property in a timely manner.

G) Under no circumstances shall the general public or other unauthorized third parties be allowed on the property to salvage material without prior written approval from the Owner.

END OF SECTION

SECTION 31 20 00 EARTH MOVING

PART 1 GENERAL

1.1 RELATED SECTIONS

Unit Prices: Section 01 22 00 "Unit Prices"

A) Site Demolition: Section 02 41 00 “Demolition”

B) Site Clearing: Section 31 10 00 “Site Preparation”

C) Silt Fencing: Section 31 10 00 “Site Preparation”

D) Storm Water Management: Section 33 40 00 “Storm Drainage Utilities”

E) Underground Utility Installations: Division 33 Sections

1.2 SUMMARY

A) Provide excavation of existing soils over the entire footprint of the proposed construction area of deleterious materials, replacement and compaction of soil materials as specified to elevations required for installation of new construction.

(1) According to soil boring data, it is assumed that existing soils will be largely acceptable as fill materials for replacement and compaction.

(2) Soil acceptability shall be monitored by the contractor during excavation. Contractor shall notify the Engineer/Owner if he encounters soils that may not be acceptable as structural fill.

B) Determining if quantities of excavated materials exceed or are less than those required in the Base Bid / Contract Sum (as specified above), is the responsibility of the contractor. Excavation and placement of fill material will be paid as lump sum.

C) If excavated materials are not suitable for replacement and/or reuse on site, and such unsuitable excavated materials are required to be removed from the site, and engineered fill materials are required to be brought onto the site from another source, the Contract Sum will be adjusted accordingly, per the values defined in Section 01 22 00. VERIFY SECTION NO.

D) Provide all engineered fills and other soil materials that are required to be added to the site (not replacing excavated deleterious soil materials) to achieve building elevations and finish grades indicated as part of the Base Bid / Contract Sum.

E) Engineered fill and other soil materials to be added to the site shall be approved by the owner prior to importing to the site.

F) Provide topsoil over all areas to receive lawn or other plantings.

1.3 REFERENCES

A) AASHTO (American Association of State Highway and Transportation Officials)

(1) M288 “Standard Specification for Geotextile Specification for Highway Applications”

B) ASTM (ASTM International)

(1) D448 “Standard Classification for Sizes of Aggregate for Road and Bridge Construction”

(2) D1557 “Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3(2,700 kN-m/m^3))”

(3) D2487 “Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)”

(4) D2940 “Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports”

(5) D4491 “Standard Test Methods for Water Permeability of Geotextiles by Permittivity”

(6) D4533 “Standard Test Method for Trapezoid Tearing Strength of Geotextiles”

(7) D4632 “Standard Test Method for Grab Breaking Load and Elongation of Geotextiles”

(8) D4751 “Standard Test Method for Determining Apparent Opening Size of a Geotextile”

(9) D4833 “Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products”

(10) D5268 “Standard Specification for Topsoil Used for Landscaping Purposes”

C) MDOT (Michigan Department of Transportation)

(1) “Standard Specifications for Construction”

(2) “Density Control Handbook”

1.4 DEFINITIONS

A) Backfill: Soil material 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) Bedding course: Course placed over the excavated subgrade in a trench before laying pipe.

C) Borrow Soil: Satisfactory soil imported from off site for use as fill or backfill.

D) Drainage Fill: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E) Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated and required.

F) Fill: Soil material used to raise existing grades.

G) 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.

H) Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

I) Unclassified Material: Any and all material to be excavated, including mud, sands, silts, clays, till, cobbles, boulders, debris, weathered rock, with the only exception being sound rock.

J) Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within building footprints.

1.5 SYSTEM DESCRIPTION

A) Perform excavation, filling, compacting, and grading operations both inside and outside the building limits as required for below-grade improvements, proper bearing surfaces, and finish grades and elevations indicated.

(1) Provide all pad prep for building footings, foundations, and slabs-on-grade.

B) If required, provide dewatering system where required to lower the static water table to a minimum of 12 inches below all excavations.

1.6 PERFORMANCE REQUIREMENTS

A) Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable subgrades.

(1) Comply with water disposal requirements of the Authorities Having Jurisdiction.

B) Design, furnish, install, monitor, and maintain temporary excavation support and protection systems.

(1) Provide support of adjacent structures during excavation operations and until excavations are closed and permanent support measures are in place.

(2) Install excavation support and protection systems without damaging existing structures and site improvements adjacent to the excavation.

(3) Engage the services of a professional engineer to advise on technical requirements of temporary excavation support and protection systems, where required to prevent structural failure.

(4) Monitor vibrations, settlements, and movements.

1.7 SUBMITTALS

A) Submit Shop Drawings.

(1) Technical specifications and mix designs for all materials proposed for use as engineered fill.

(2) Excavation support and protection systems, if required.

B) Submit Sealed Shop Drawings.

(1) Excavation support and protection systems, if required.

C) Submit Test Results.

(1) Results of any geotechnical analyses, including soil bearing capacity determinations, water table elevations, reports on deleterious subsurface materials, subsurface features and obstructions, that are completed during construction.

(2) Compaction test results prior to placement of pavements, concrete footings, and slabs on grade.

1.8 QUALITY ASSURANCE

A) Where shoring and bracing is required, provide engineered design of system and take responsibility for all materials, means, and methods used in the design and implementation of the system.

B) Where a dewatering system is required, provide engineered design of system and take responsibility for all materials, means, and methods used in the design and operation of the system.

C) Control dust at the Project Site at all times to prevent dust from becoming a nuisance to the public, adjacent properties, or other Work on the Site.

D) Take special care when excavating in the proximity of all underground utilities.

(1) Obtain assistance from the appropriate utility companies in locating their respective lines, structures, and other properties.

(2) Provide support for all utilities within excavations

(3) Provide proper compaction under all undermined utility structures and, if necessary, provide temporary sheeting or use a trench box to minimize the excavation.

(4) Protect and save from damage all utilities, whether privately or publicly owned, above or below ground surface, which may be encountered during construction, at no additional cost to the Owner.

E) Take full responsibility for all liabilities or claims resulting from damaged caused by excavation and earthwork operations.

(1) Indemnify, defend and hold harmless the Owner and Engineer from any such claims or lawsuits.

F) Provide/Coordinate testing of allowable bearing pressures of soils.

G) Provide/Coordinate testing of relative compaction of soils in preparation for placement of concrete slabs-on-grade.

H) Special inspections for existing site soil conditions, fill placement and load-bearing requirements may be required by Engineer at the cost of the Owner.

(1) The approved soils report, the documents prepared by the registered design professional in responsible charge, and the requirements of the Building Code shall be used to determine compliance.

(2) During fill placement, the special inspector shall determine that proper materials and procedures are used in accordance with the provisions of the approved soils report.

(3) Verification of use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill shall be conducted on a continuous basis during the times that fill materials are being placed and compacted. Other verification and inspection tasks (as listed in Table 1704.7 of the Building Code) shall be conducted periodically.

(4) Special inspections are not required during placement of controlled fill having a total depth of 12 inches or less.

PART 2 PRODUCTS

2.1 MATERIALS

A) Engineered Fill (Subbase): Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand conforming to ASTM D2940 and MDOT Class II.

(1) Minimum Percent Passing 1-1/2 Inch Sieve: 90.

(2) Maximum Percent Passing No. 200 Sieve: 12.

B) Gravel (Drainage) Fill: Washed, narrowly graded mixture of crushed stone, pea stone, or gravel conforming to ASTM D448.

(1) Coarse-Aggregate Grading Size: 57.

(2) Percent Passing 1-1/2 Inch Sieve: 100.

(3) Percent Passing No. 8 Sieve: 0 to 5.

C) Washed Septic Stone Fill: Washed, graded, and evenly mixes 10-A round stone conforming to ASTM D448.

(1) Percent Passing 1-1/2 inch Sieve: 100.

(2) Percent Passing 1 inch Sieve: 80.

(3) Percent Passing 1/2 inch Sieve: 0 to 5.

(4) Do not use material containing sand, silt, or other fines.

D) Subgrade: Natural, well-draining, undisturbed ground, graded and proof-rolled and/or compacted as required to achieve bearing capacities for structures indicated.

(1) Acceptable Subgrade Materials: Soils complying with classification groups GW, GP, GM, SM, SW, SP, and SM, per ASTM D2487, free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

(2) Unacceptable Subgrade Materials: Soils complying with classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, per ASTM D2487.

(3) Unacceptable soils also include satisfactory soil materials not maintained within 2 percent of optimum moisture content at time of compaction.

E) Backfill: Clean, uniformly graded, well-draining, granular material, free of frozen, organic, and other deleterious matter, and complying with the specifications of MDOT Class II material.

(1) Acceptable Backfill Materials: Soils complying with classification groups GW, GP, GM, SM, SW, SP, and SM, per ASTM D2487, free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

(2) Unacceptable Backfill Materials: Soils complying with classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, per ASTM D2487.

(3) Unacceptable soils also include satisfactory soil materials not maintained within 2 percent of optimum moisture content at time of compaction.

F) Topsoil: Well graded, dark brown or black loam, clay loam, or sandy loam, or a fertile, humus soil origin, per ASTM D5268.

(1) Minimum Total Thickness: 4 inches.

(2) Provide screened material with a maximum stone dimension of 3/8 inch for the top 4 inches minimum.

(3) Where existing site topsoil stripped and stored from the Project site is insufficient in quantity or does not meet the above specification, provide topsoil from off site to improve, augment, and/or replace the deleterious existing material.

(4) Topsoil provided from an offsite location shall be free of contamination and is subject to approval by owner.

(5) Do not use existing topsoil that is not in compliance with the above specification or is in any other way deleterious.

G) Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile made from polyolefins or polyesters and manufactured for subsurface drainage applications.

(1) Minimum Elongation: 50 percent, per AASHTO M288.

(2) Survivability: Class 2, per AASHTO M288.

(3) Minimum Grab Tensile Strength: 157 pound-feet, per ASTM D4632.

(4) Minimum Sewn Seam Strength: 142 pound-feet, per ASTM D4632.

(5) Minimum Tear Strength: 56 pound-feet, per ASTM D4533.

(6) Minimum Puncture Strength: 56 pound-feet, per ASTM D4833.

(7) Minimum UV Stability: 50 percent after 500 hours exposure, per ASTM D4533.

H) Separation Geotextile: Woven geotextile fabric made from polyolefins or polyesters and manufactured for soil separation applications.

(1) Minimum Elongation: 50 percent, per AASHTO M288.

(2) Survivability: Class 2, per AASHTO M288.

(3) Minimum Grab Tensile Strength: 247 pound-feet, per ASTM D4632.

(4) Minimum Sewn Seam Strength: 222 pound-feet, per ASTM D4632.

(5) Minimum Tear Strength: 90 pound-feet, per ASTM D4533.

(6) Minimum Puncture Strength: 90 pound-feet, per ASTM D4833.

(7) Maximum Apparent Opening Size: No. 60 sieve, per ASTM D4751.

(8) Minimum Permittivity: 0.02 per second, per ASTM D4491.

(9) Minimum UV Stability: 50 percent after 500 hours exposure, per ASTM D4533.

PART 3 EXECUTION

3.1 PREPARATION

A) Notify the Engineer of any apparent inadequacy of rough grading prior to commencement of building and site work.

(1) Contractor’s commencement of construction shall indicate acceptance of rough grades and any further earthwork required to complete the Project shall become the responsibility of the Contractor.

B) Notify “Miss Dig” at least 3 working days prior to subsurface excavation or construction.

(1) Telephone Number: (800-482-7171).

C) Verify the presence and locations of any and all underground utilities, tanks, piping, existing foundations, and other subsurface structures.

D) Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

E) Do not interrupt utilities serving facilities occupied by Owner or others without at least 48 hours prior notice.

(1) Provide temporary utility services where needed utility services are interrupted for an extended length of time, as directed by the Owner.

3.2 SOIL BORINGS

A) Soil borings may be provided at the sole discretion and cost of the Owner.

3.3 EXCAVATION

A) Excavate existing site materials as indicated and as required for new construction.

(1) All existing site materials are “Unclassified Materials,” unless specifically indicated otherwise in the Contract Documents.

(2) Completely remove from the Site all materials not required for backfill or other approved uses in this Project.

B) Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before proceeding with further excavation, construction, or placing of fill materials.

(1) If existing topsoil meets the specification for new topsoil given above, remove, store, and protect existing topsoil for use in final grading of landscaped areas.

(2) If existing topsoil can be processed and improved to meet the specification for new topsoil given above, remove, store, protect, process, and improve existing topsoil, for use in final grading of landscaped areas.

(3) Dispose of deleterious topsoil and other removed materials properly off-site.

(4) Do not burn or bury vegetation, debris, unsatisfactory soil materials, obstructions, or other deleterious materials on site.

C) Do not use explosives.

D) Remove abandoned subsurface structures and utility lines encountered during excavation operations.

E) Take complete responsibility for the design and execution of excavation support and protection systems.

(1) Pay for all costs associated with the design and execution of excavation support and protection systems.

(2) Shore and brace the sidewalls of deep or unstable excavations.

(3) Take adequate measures to prevent the collapse of excavations, including securing the services of a civil engineer if required to assist in the implementation of safe excavation support and protection procedures.

(4) Provide dewatering measures if required to protect excavations.

(5) Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations

F) Exercise care during excavation such that existing items-to-remain are not damaged.

(1) Hand dig, or use a vacuum truck, to excavate around all buried utilities.

(2) Use a vacuum truck excavator to excavate around all buried utilities including, but not limited to, main power feed, telephone service, and the existing CT power line. Give the Owner advance notice so that a representative of the Owner may be present during excavation operations.

(3) If existing utilities or services are damaged from demolition, excavation, or construction activities, immediately repair any damage and restore the utilities and services to an equal or better condition than that which existed prior to the damage.

(4) Completely remove all deleterious or obstructing items not intended to remain.

G) Where muck or other deleterious or unacceptable soils are encountered at excavation bottoms, undercut a minimum of 15 inches and replace with acceptable subgrade material.

(1) Compact new subgrade material in place.

H) Excavate for all walls, footings, floors, pavements, and other on-or-below-grade constructions, removing all fill and organic material.

(1) Protect excavation bottoms from frost.

(2) Provide engineered fill (subbase) as required to replace deleterious subgrade materials.

I) Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing.

(1) Place, grade, and shape stockpiles to drain surface water without excessive erosion or washout.

(2) Cover stockpiles where required to prevent windblown dust and erosion.

(3) Stockpile soil materials away from edge of excavations.

(4) Do not store soil materials within the drip line of remaining trees.

J) Compact subbase materials to receive load-bearing structures above.

(1) Compact subbase under footings and floors to 95 percent Modified Proctor density.

(2) Compact subbase under walks and parking areas, to 90 percent Modified Proctor density.

K) Proof-roll subgrades under roads, drives, parking areas, plazas, and sidewalks with heavy pneumatic-tired equipment or heavy vibratory rollers.

(1) Completely proof-roll subgrade in one direction, repeating proof-rolling in the direction perpendicular to the first direction.

(2) Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons, or a heavy vibratory roller, 10,000 lbs, or larger.

(3) Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, and replace with compacted backfill or engineered fill material.

(4) Do not proof-roll subgrades located less than 18 inches above the adjacent ground water table.

(5) Do not proof-roll excessively wet or saturated subgrades.

L) If adverse soils conditions are found in excavations for footings and slabs on grade, consult a qualified soils engineer to analyze sub-surface water drainage, hydrostatic conditions, and bearing capacities, and provide recommendations for improvement of adverse conditions.

(1) Where a conflict arises between maximum soil bearing capacities indicated in the Contract Documents and those determined by on-site geotechnical engineering analysis, comply with the most stringent and conservative values.

(2) Where allowable soil bearing pressures cannot be attained for any reason, notify the Engineer and obtain instructions for modification of the foundation design.

M) Protect excavations, trenches, and other soils to receive footings, slabs, or pavements from flooding and erosion.

(1) Provide temporary de-watering and storm water control measures as required to protect exposed soils, trenches, and subgrades from damage due to flooding or erosion.

N) Protect excavations, trenches, and other soils to receive footings, slabs, or pavements from freezing.

(1) Provide protective insulating blankets, supplemental heat, or other temporary measures as required to keep soils and subgrades above 32 degrees Fahrenheit.

O) Do not place bottom of footings less than 42 inches below final adjacent grade, unless specifically indicated otherwise and approved by the Engineer and building code Authorities Having Jurisdiction.

P) Place footings and slabs-on-grade on undisturbed granular, inorganic, well-draining subgrade soils except where engineered fill is specified or deemed necessary due to poor quality existing soil conditions, or an increase in the finish grade elevation.

3.4 UTILITY TRENCHING

A) Provide trenching for site utilities installations, including installations of sleeves, direct-buried utility lines, taps, and connections.

(1) Use hand tools or a vacuum truck where mechanical equipment may damage adjacent trees, structures, or existing utilities.

(2) Support and protect all existing utilities encountered in trench excavations.

(3) Where clay, stone, muck, or other deleterious material is encountered at the bottom of the excavation, undercut the bottom a minimum of 6 inches and backfill to proposed pipe grade with Class II material compacted to 95 percent Modified Proctor density.

B) Excavate trenches to uniform widths to provide clearances on each side of pipes or conduits.

(1) Maximum trench width for pipes and conduits 6 inches through 10 inches in diameter: 30 inches.

(2) Maximum trench width for pipes and conduits 12 inches through 30 inches in diameter: Outside diameter plus 24 inches.

(3) Maximum trench width for pipes and conduits over 30 inches in diameter: Outside diameter plus 36 inches.

(4) Maximum trench width for elliptical pipes and conduits: Outside diameter plus 36 inches.

C) Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduits.

(1) Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

(2) Remove projecting stones and sharp objects along trench subgrade.

(3) Excavate trenches 4 inches deeper than elevation required to allow for bedding course, if required.

D) Avoid tree drip line areas when placing trenches.

(1) Detour trenches around tree drip line areas, where possible.

3.5 EXCAVATION SUPPORT AND PROTECTION

A) 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.

(1) Utilize appropriate structural steel, wood, and/or other materials that are either new or in serviceable condition for temporary support and protection of excavations.

(2) Provide anchors, piles, and bracing as required to safely secure excavation support and protection materials in place for the duration of their use.

B) Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

(1) Locate excavation support and protection systems clear of permanent construction so that installation and finishing of new Work is not impeded.

C) Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open.

(1) Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

D) Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

E) Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures.

(1) Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

3.6 DEWATERING

A) Where required, due to high static water table, flowing surface or subsurface water, provide dewatering system in accordance with applicable regulations and best industry practices.

(1) Provide dewatering continuously until the structure or pipe is installed.

(2) Prevent damage from hydrostatic pressures, and flotation.

(3) Monitor dewatering system at frequent intervals to insure proper operation.

(4) Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

(5) Provide standby equipment as necessary to avoid equipment or power failure.

(6) Prevent sand and silt from discharging into sewer drains or natural waterways, using silt fencing, sediment traps, or other means to protect surface water discharges.

(7) Remove all sediment deposits created as a result of the dewatering process.

(8) Do not interfere with adjacent properties, public lands, rights of way, pedestrian and vehicular traffic, or the timely progress of the Work.

(9) Repair any damage from dewatering activities at no cost to the Owner.

(10) Remove all dewatering wells and equipment after completion of dewatering operations.

3.7 BACKFILLING AND COMPACTION

A) Where excavated existing (native) soils are not acceptable backfill materials, provide borrow soil composed of acceptable materials.

(1) Unless the Owner has specifically approved their retention, remove unacceptable soil materials from the Site.

B) Compact native soils and backfill under areas to receive new construction.

(1) Comply with the applicable requirements of MDOT “Density Control Handbook.”

(2) Under Structures, Building Slabs, Steps, Utility Trenches, and Pavements: Compact to a minimum dry density of 95 percent of the maximum dry density as determined by ASTM D1557 (Modified Proctor).

(3) Under Walkways: Compact to a minimum dry density of 90 percent of the maximum dry density as determined by ASTM D1557 (Modified Proctor).

(4) Under Landscaped Areas Not Supporting Structures or Pavements: Compact to a minimum dry density of 85 percent of the maximum dry density as determined by ASTM D1557 (Modified Proctor).

C) Place backfill in 8 inch to 12 inch loose lifts, compacting each lift (and facilitating performance of compaction testing, as specified in “Field Quality Control” below) before applying the next lift.

(1) Where hand-operated tampers are used, place backfill in maximum 6 inch loose lifts.

(2) Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D) Where foundation and retaining walls require fill placed on both sides, place and compact the fill on each side simultaneously so as to maintain equal lateral pressures on each side of the wall.

E) Temporarily brace walls retaining earth against backfilling until permanent floor tie-ins are constructed and walls have reached their design capacities.

3.8 GRADING

A) Grade surfaces to allow surface drainage to reach storm drains or detention areas within the Project site.

(1) Grading Tolerance for Landscaped Areas: Plus or minus 1 inch.

(2) Grading Tolerance for Walkways, Pavements, and Areas within Building Lines: Plus or minus 1/2 inch.

B) Slope finished grade away from the building foundation in accordance with the elevations indicated, but not less than 6 inches in 10 feet.

(1) If the natural grade slopes toward the building, build shallow trenches or swales to direct water runoff away from the building.

C) Coordinate final grading and installation of other site features with Owner's installation of irrigation system (NIC).

D) Remove surplus soil and fill materials, including unsatisfactory soils, trash and debris, from the site.

3.9 TOPSOIL PLACEMENT

A) Place topsoil over all disturbed areas indicated to receive lawn or other plantings.

(1) Remove all construction debris and other deleterious substances from areas to receive topsoil, including stones larger than 1-1/2 inches in any dimension, roots, branches, scrap building materials, and refuse.

(2) Place topsoil materials evenly, insuring that the top 4 inches minimum are covered with screened topsoil material.

(3) Rake topsoil surfaces smooth and even, in accordance with site grades indicated and as required to produce smooth transitions between existing site features and elevations, removing high areas and filling depressions.

B) Remove surplus topsoil material, including unsatisfactory soils, trash and debris, from the site.

3.10 FIELD QUALITY CONTROL

A) The Owner reserves the right to engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports, in part or in whole.

(1) Testing agency will test compaction of soils in place in accordance with applicable ASTM standards and the requirements of Authorities Having Jurisdiction.

(2) Perform compaction tests at the minimum rate of 1 test per 2,000 square feet of slab on grade area, but not less than 3 tests overall.

(3) Perform compaction tests at the minimum rate of 1 test per 50 lineal feet of strip footing, but not less than 4 tests overall.

(4) Perform compaction tests at the minimum rate of 1 test per isolated footing, or areas where there is a concentrated load.

(5) Perform compaction tests at the minimum rate of 1 test per 100 lineal feet of trench length (where the trench runs under pavements, footings, or slabs on grade), but not less than 2 tests per trench overall.

(6) Perform compaction tests in each location to be tested at each backfill lift layer.

B) Coordinate with the testing agency to facilitate efficient and accurate test procedures.

(1) Communicate appropriate times to the testing agency for test site visits.

(2) Allow testing agency to test and inspect subgrades and each fill or backfill layer.

(3) Proceed with subsequent earthwork only after test results for previously completed Work comply with the requirements.

C) Submit copies of all test results to the Engineer, for information.

D) If the testing agency reports that subgrades, fills, or backfills have not achieved the degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required, at no cost to the Owner.

(1) Re-compact and retest at Contractor's expense until specified compaction is obtained.

3.11 PROTECTION, REPAIR AND REPLACEMENT

A) Protect graded areas from traffic, freezing, and erosion.

(1) Keep free of trash and debris.

B) Repair or replace existing property damaged by excavation, trenching, dewatering, backfilling, compaction, and grading operations, including, but not limited to, the following:

(1) Building structures, decks and patios

(2) Retaining walls.

(3) Exterior steps and stairs.

(4) Roads and bridges.

(5) Driveways and parking areas.

(6) Site furnishings and playground equipment.

(7) Curbs, gutters, and sidewalks.

(8) Trees, landscaping, fences and signs.

(9) Irrigation systems.

(10) Utility lines and piping.

C) Where settling has occurred, remove finished surfacing, backfill with additional soil materials, compact, and reconstruct surfacing.

(1) Restore appearance, quality, and condition of finished surfacing to match adjacent work, without evidence of restoration to the greatest extent possible.

D) Recondition existing lawn areas damaged by construction operations, including storage of materials and equipment and movement of vehicles.

(1) Recondition existing lawn areas when minor re-grading is required or where new planting abuts existing lawns.

3.12 SITE MAINTENANCE DURING CONSTRUCTION

A) Site excavation and grading shall be maintained throughout the construction project to minimize surface water entrapment and erosion.

B) Maintain slopes in a safe condition to prevent cave-ins and shear failure.

C) Site construction entrance and access drive to the work area shall be maintained in a passable condition for regular on-road traffic.

END OF SECTION

SECTION 31 25 00 EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.1 DESCRIPTION

A) Section Includes: All work related to installation, operation and maintenance of all Erosion Control Measures

B) Silt Fence

C) Inlet protection devices

D) Rock Energy Dissipator

E) Check Dams

1.2 RELATED SECTIONS:

A) Section 31 10 00 - Site Clearing.

B) Section 31 22 13 - Rough Grading.

C) Section 31 23 17 – Trenching.

D) Section 31 23 19 – Dewatering.

1.3 REFERENCES

A) American Association of State Highway and Transportation Officials:

(1) AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.

(2) AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications

B) ASTM International:

(1) ASTM D3786 - Standard Test Method for Bursting Strength of Textile Fabrics - Diaphragm Bursting Strength Tester Method

(2) ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus

(3) ASTM D4491 - Test Methods for Water Permeability of Geotextiles by Permittivity

(4) ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles

(5) ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

(6) ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile

(7) ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

1.4 SUBMITTALS

A) Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B) Product Data: Product Data: Submit data on geotextile fabric, inlet protection devices, and silt fencing.

PART 2 PRODUCTS

2.1 SILT FENCING

A) Manufacturer/Supplier	Product Name
(1) Belton Industries, Inc., Norcross, SC	Belton 940
(2) CSI Geoturf, Highland, MI	Geoturf S1200
(3) CSI Geoturf, Highland, MI	Geoturf S1400

(4) Geoproducts, Inc., Birmingham, MI Kintex SF-3

(5) LinQ Industrial Fabrics GTF-180

(6) Propex Fabrics, Inc., Austell, GA Propex 2130

(7) Skaps Industries, Athens, GA SKAPS W100

(8) Hanes Geo Components, Winston-Salem, NC TerraTex SC

(9) Willacoochee, GA Willacoochee, Style 1210

(10) Substitutions: Section 01 60 00 - Product Requirements: Substitution Procedures

B) INLET PROTECTION DEVICES

C) Removable inlet protection device constructed of geotextile material sewn to dimensions that allow for drop in installation in catch basin inlets.

D) Geotextile material:

Grab Tensile ASTM D4632 lbs. 255 x 275
Grab Elongation ASTM D-4632 % 20 x 15
Trap Tear ASTM D-4533 lbs. 40 x 50
Puncture ASTM D-4833 lbs. 135
Mullen Burst ASTM D-3786 psi 420
Permittivity ASTM D-4491 sec-1 1.5
Water Flow ASTM D-4491 gpm/ft2 200
AOS ASTM D-4751 U.S. Std 20
UV Resistance ASTM D-4355 %/hrs. 90/500

E) Frame: metal or wood insert(s) to prevent device from dropping in catch basin and to allow for attachment of removal straps

F) Manufacturers:

(1) ACF Environmental: Siltsack®

2.2 ROCK AND GEOTEXTILE MATERIALS

A) Stone

(1) Stabilized Construction Access: Stone materials shall be Coarse Aggregate, 3 x 1 conforming to Section 916 of the 2012 MDOT Standard Specifications for Construction.

(2) Energy Dissipator: Stone shall be Plain Rip-Rap conforming to Section 916 of the 2012 MDOT Standard Specifications for Construction.

B) Geotextile Fabric: Non-biodegradable, non-woven.

C) Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods reference:

Survivability: Class 2; AASHTO M 288.
Apparent Opening Size: No. 40 (0.425-mm) sieve, Maximum; ASTM D 4751.
Permittivity: 0.5 per second, minimum; ASTM D 4491.
UV Stability: 50 percent after 500 hours exposure; ASTM D 4355

PART 3 EXECUTION

3.1 EXAMINATION

A) Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B) Verify compacted subgrade is acceptable and ready to support devices and imposed loads.

C) Verify gradients and elevations of base or foundation for other work are correct.

3.2 SILT FENCING

A) Install silt fencing.

(1) Align silt fence perpendicular to the direction of runoff with stakes on the downhill side of the fabric.

(2) Excavate shallow trench, install silt fence and backfill. Bottom of fabric to extend minimum 6 inches below grade

(3) Install silt fence at an even grade. Avoid low spots in silt fence.

(4) At ends of silt fence run, extend fencing up slope at a 45-degree angle to the main run for a minimum distance of 10 feet.

B) Maintain silt fencing.

(1) Remove accumulated sediment when sediment level reaches one third the height of the fabric.

(2) Repair or replace damaged silt fencing immediately.

C) Remove silt fencing

(1) Upon completion of the work, and sufficient stabilization of disturbed soils, remove accumulated sediment.

(2) Remove silt fencing.

(3) Restore disturbed soils with seed and mulch.

3.3 INLET PROTECTION

A) Installation

(1) Install inlet protection devices in existing storm sewers prior to soil disturbance.

(2) Install inlet protection devices in new storm sewers immediately after storm sewer is constructed.

(3) Install inlet protection devices at all storm sewer inlets within site and beyond site which may receive construction site storm water runoff.

(4) Obtain approval from authority having jurisdiction for catch basins within public streets.

B) Maintenance

(1) Remove accumulated sediment when sediment level reaches one third of depth of the device.

(2) Repair or replace damaged geotextile immediately.

(3) Continue maintenance until soil in contributing area is stabilized.

C) Removal

(1) Remove inlet protection device upon sufficient stabilization of disturbed soils within contributing area after approval by Engineer.

3.4 ROCK ENERGY DISSIPATOR

A) Excavate to nominal placement dimensions as follows. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

Pipe Size (inches)	Width (feet)	Length (feet)	Depth (feet)	Rock Size (inches)	Volume (cubic yards)
12	4	8	1.5	4 - 8	2
24	6	10	1.5	4 - 8	3
36	8	12	2	4 - 12	7
48	10	16	2	4 - 12	12

B) Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream.

C) Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.

D) Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.

3.5 SITE STABILIZATION

A) Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B) Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C) Stabilize any disturbed area on which activity has ceased and which will remain exposed for more than 20 days.

(1) During non-germinating periods, apply mulch at recommended rates.

(2) Stabilize disturbed areas which are at finished grade.

D) Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.6 FIELD QUALITY CONTROL

A) Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

3.7 CLEANING

A) When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

B) Do not damage structure or device during cleaning operations.

C) Do not permit sediment to erode into construction or site areas or natural waterways.

END OF SECTION

SECTION 32 11 16 SUBBASE COURSES

PART 1 GENERAL

1.1 DESCRIPTION

A) Section Includes:

(1) Prepared Subbase.

1.2 RELATED SECTIONS:

A) Section 31 22 13 - Rough Grading.

B) Section 31 23 17 - Trenching.

C) Section 31 23 19 - Dewatering.

D) Section 31 25 13 - Erosion Controls.

E) Section 32 11 24 - Aggregate Base Courses

F) Section 32 12 16 - Asphalt Paving.

G) Section 32 13 13 - Concrete Paving

1.3 REFERENCES

A) American Association of State Highway and Transportation Officials:

(1) AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B) ASTM International:

(1) ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

(2) ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

(3) ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C) Michigan Department of Transportation (MDOT)

(1) Manual for the Michigan Test Methods: MTM 107 - Sampling Aggregates

(2) Manual for the Michigan Test Methods: MTM 108 - Percent Loss by Washing

(3) Manual for the Michigan Test Methods: MTM 109 - Sieve Analysis

(4) Density Testing and Inspection Manual: One Point T-99 Test

(5) Density Testing and Inspection Manual: Michigan One Point Cone Test

(6) Density Testing and Inspection Manual: Density In-Place (Nuclear) Test

1.4 SUBMITTALS

A) Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B) Materials Source: Submit source location and name of materials suppliers.

C) Manufacturer's Certificate: Certify material meets or exceeds specified requirements.

1.5 QUALITY ASSURANCE

A) Furnish each material from single source throughout the Work.

B) Notify Engineer minimum two weeks prior to scheduled delivery of material.

C) Allow Owner's representative access to material source for sampling and testing.

A. Confirm test results indicate conformance with specifications prior to delivery to site.

D) Owner reserves the right to collect and test additional samples of material after delivery to site.

PART 2 PRODUCTS

2.1 MATERIALS

A) Subbase Aggregate: Granular material Class II conforming to Section 902, Tables 902-3 and 902-4 of the 2012 MDOT Standard Specifications for Construction.

B) Suitable on site material may be utilized as subbase aggregate with approval of Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

A) Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B) Verify compacted substrate is dry and ready to support paving and imposed loads.

(1) Proof roll substrate with heavy, bucket loaded rubber tired loader in minimum two perpendicular passes to identify soft spots, if any suspected.

(2) Remove soft substrate and replace with compacted fill as specified in Section 31 22 13 - Rough Grading

C) Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

A) Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B) Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A) Place subbase aggregate in equal thickness layers to total compacted thickness indicated on Drawings. Maximum Layer Compacted Thickness: 12 inches.

B) Roller compact subbase to 95 percent maximum density as defined by ASTM D1557.

C) Level and contour surfaces to elevations, profiles, and gradients indicated.

D) Maintain optimum moisture content of fill materials to attain specified compaction density.

E) Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A) Section 01 40 00 - Quality Requirements: Tolerances.

B) Maximum Variation from Flat Surface: 1/2 inch measured with 10 foot straight edge.

C) Maximum Variation from Thickness: 1/2 inch.

D) Maximum Variation from Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

A) Section 01 40 00 - Quality Requirements

B) Owner's representative will perform laboratory testing of material to determine gradation in accordance with ASTM C117 and ASTM C136.

C) Owner's representative will perform testing to determine maximum density in accordance with ASTM D1557 or Michigan Cone Method.

D) Owner's representative will perform in place compaction tests in accordance with the following:

(1) Density Tests: ASTM D2922 and the procedures described in the MDOT Density Testing and Inspection Manual. Where conflicts arise, the ASTM standard shall prevail.

(2) Moisture Tests: ASTM D3017 and the procedures described in the MDOT Density Testing and Inspection Manual. Where conflicts arise, the ASTM standard shall prevail.

E) When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

F) Frequency of Tests: One test for every 250 square yards of each layer compacted aggregate. Additional testing may be required at the discretion of the engineer.

END OF SECTION

SECTION 32 11 23 AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 DESCRIPTION

A) Section Includes:

(1) Aggregate base course.

B) Related Sections:

(1) Section 31 22 13 - Rough Grading.

(2) Section 31 23 17 - Trenching.

(3) Section 31 25 13 - Erosion Controls.

(4) Section 32 11 23 - Prepared Subbase.

(5) Section 32 12 16 - Asphalt Paving.

(6) Section 32 13 13 - Concrete Paving

1.2 REFERENCES

A) American Association of State Highway and Transportation Officials:

(1) AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B) ASTM International:

(1) ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

(2) ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

(3) ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C) Michigan Department of Transportation (MDOT)

(1) Manual for the Michigan Test Methods: MTM 107 - Sampling Aggregates

(2) Manual for the Michigan Test Methods: MTM 108 - Percent Loss by Washing

(3) Manual for the Michigan Test Methods: MTM 109 - Sieve Analysis

(4) Density Testing and Inspection Manual: One Point T-99 Test

(5) Density Testing and Inspection Manual: Michigan One Point Cone Test

(6) Density Testing and Inspection Manual: Density In-Place (Nuclear) Test

1.3 SUBMITTALS

A) Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B) Samples: Submit, in air-tight containers, 10 lb. sample of each type of material to testing laboratory.

C) Materials Source: Submit name and location of aggregate materials suppliers.

D) Manufacturer's Certificate: Certify materials meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A) Furnish each material from single source throughout the Work.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

A) Aggregate Base: Dense-graded aggregate 22A conforming to Section 902, Tables 902-1 and 902-2 of the 2012 MDOT Standard Specifications for Construction.

PART 3 EXECUTION

3.1 EXAMINATION

A) Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B) Verify subbase has been inspected, gradients and elevations are correct.

3.2 PREPARATION

A) Complete the work of section 32 11 16 Subbase Courses.

B) Correct irregularities in subbase gradient and elevation by scarifying, reshaping, and recompacting.

C) Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A) Place aggregate in equal thickness layers to total compacted thickness indicated on Drawings. Maximum Layer Compacted Thickness: 6 inches.

B) Roller compact aggregate to 98 percent maximum density as defined in accordance with ASTM D 1557.

C) Level and contour surfaces to elevations, profiles, and gradients indicated.

D) Maintain optimum moisture content of fill materials to attain specified compaction density.

E) Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A) Section 01 40 00 - Quality Requirements: Tolerances.

B) Maximum Variation from Flat Surface: 1/4 inch measured with 10 foot straight edge.

C) Maximum Variation from Thickness: 1/4 inch.

D) Maximum Variation from Elevation: 1/4 inch.

3.5 FIELD QUALITY CONTROL

A) Section 01 40 00 - Quality Requirements.

B) Owner's representative will perform laboratory testing of material to determine gradation in accordance with ASTM C117 and ASTM C136.

C) Owner's representative will perform testing to determine maximum density in accordance with ASTM D 1557 or Michigan Cone Method.

D) Owner's representative will perform in place compaction tests in accordance with the following:

(1) Density Tests: ASTM D2922 and the procedures described in the MDOT Density Testing and Inspection Manual. Where conflicts arise, the ASTM standard shall prevail.

(2) Moisture Tests: ASTM D3017 and the procedures described in the MDOT Density Testing and Inspection Manual. Where conflicts arise, the ASTM standard shall prevail.

E) When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

F) Frequency of Tests: One test for every 250 square yards of each layer of compacted aggregate. Additional testing may be required at the discretion of the engineer.

END OF SECTION

SECTION 32 12 16 ASPHALT PAVING

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Clearing and Preparation: Section 31 10 00 “Site Clearing”

B) Base Preparation: Section 31 20 00 “Earth Moving”

C) Pavement Marking Paint: Section 32 17 00 “Paving Specialties”

1.2 REFERENCES

A) ASTM (ASTM International)

(1) C117 “Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing”

(2) C136 “Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates”

(3) D1557 “Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3(2,700 kN-m/m^3))”

(4) D2922 “Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)”

B) MDOT (Michigan Department of Transportation)

(1) “Standard Specifications for Construction” [have internet pdf download from mdot website]

1.3 SUBMITTALS

A) Submit Product Data.

(1) Asphalt pavement mix designs.

B) Test Results.

(1) Base compaction test results.

(2) Asphalt quality test results.

1.4 QUALITY ASSURANCE

A) Comply with applicable local, municipal, and state regulations regarding asphalt materials, installation details, and workmanship in effect at the Project location.

B) Provide and place bituminous pavements in accordance with MDOT “Standard Specifications for Construction.”

C) At its sole cost and discretion, the Owner may take material for bituminous extractions and aggregate analysis.

(1) Determine pavement density by the Nuclear Gage Method using the Test Strip Method.

(2) Determine gradation in accordance with ASTM C136.

(3) Determine percent loss by washing in accordance with ASTM C117.

D) Provide only fill and subbase materials approved by the Engineer.

E) Base Compaction:

(1) Determine maximum density using the Modified Proctor Method, ASTM D1557, or by another method approved by the Engineer.

(2) Determine field, in-place density by the Nuclear Density Method, ASTM D2922, or by another method approved by the Engineer.

F) Furnish weight slips for all bituminous material, upon request of Engineer, Owner, or Authorities Having Jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS

A) Subbase: Granular material conforming to MDOT Class II.

B) Aggregate Base and Surface Course Material: MDOT Aggregate 22A.

C) Hot Mix Asphalt Base/Leveling Course: MDOT 4E1

(1) ~~Standard Duty Minimum Thickness: 1-1/2 inches (165 pounds per square yard).~~

(2) Heavy Duty Minimum Thickness: 2 inches (220 pounds per square yard).

D) Hot Mix Asphalt Surface/Wearing Course: MDOT 4E1.

(1) ~~Standard Duty Minimum Thickness: 1-1/2 inches (165 pounds per square yard).~~

(2) Heavy Duty Minimum Thickness: 2 inches (220 pounds per square yard).

E) Bond/Tack Coat: MDOT SS-1h asphalt emulsion.

(1) Provide weed control agents in granular, liquid, or wettable powder form.

F) All materials placed within the MDOT or county right-of-way shall conform to permit specifications.

PART 3 EXECUTION

3.1 REMOVAL OF EXISTING PAVEMENT SURFACES

A) Minimize the amount of existing pavement which must be removed.

B) Saw cut pavement to full depth at removal limits.

C) Remove existing pavements by cold milling to grades and cross sections required, for partial depth removal.

D) Provide trenches for subsurface work required for the Project.

(1) Pavement Cut Width for Trenches Crossing Roads: A distance equal to the excavation depth plus the diameter of the pipe, measured perpendicular to and extending to both sides of the pipe line.

(2) Pavement Cut Width for Trenches Less than 1/4 of Road Width, Running Longitudinal to Roads: 1/4 of road width.

(3) Pavement Cut Width for Trenches Between 1/4 and 1/2 of Road Width, Running Longitudinal to Roads: 1/2 of road width.

(4) Pavement Cut Width for Trenches Wider than 1/2 of Road Width, Running Longitudinal to Roads: Full road width.

3.2 PREPARATION

A) Protect existing pavement outside of areas receiving new pavement.

B) Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

(1) Minimum Tack Coat Surface Temperature: 60 degrees Fahrenheit.

(2) Minimum Surface Temperature of Asphalt Base Course: 40 degrees Fahrenheit and rising at the time of placement.

(3) Minimum Surface Temperature of Asphalt Surface Course: 60 degrees Fahrenheit at the time of placement.

C) Place compacted aggregate paving base.

(1) Minimum Depth for Paved Surfaces: 6 inches.

(2) Minimum Depth for Gravel Shoulders: 8 inches.

(3) Compact in place to at least 95 percent maximum density.

(4) Extend paving base to a width required for paved surfaces and gravel shoulders.

D) Finish grade base to the elevations and cross sections required.

E) Prepare trenches by placing and compacting backfill as specified in Section 31 20 00 “Earth Moving.”

F) Do not place paving until the Engineer has approved the base.

3.3 BITUMINOUS PAVEMENT INSTALLATION

A) Conform to MDOT specifications for placing asphalt.

B) Apply bituminous (hot mix asphalt) paving in two courses:

(1) Base/Leveling course as specified in Part 2 above

(2) Surface/Wearing course as specified in Part 2 above

(3) Total Thickness of Asphalt Paving in 2 courses per Above.

C) Compact paving by rolling to 95 percent maximum density.

D) Apply bond/tack coat at a rate of 0.10 gallons per square yard between each pavement course and on surfaces of existing pavement to receive new asphalt pavement.

E) Do not lay pavement faster than 150 feet per minute.

F) Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement.

(1) Provide breakdown (or initial) rolling, intermediate rolling, and finish rolling in accordance with MDOT standards.

(2) Compact asphalt with hand tampers or vibratory plate compactors in areas inaccessible to rollers.

(3) Complete compaction before mix temperature cools to 185 degrees Fahrenheit.

3.4 PAVEMENT PATCHING

A) Place aggregate paving base and bituminous surface as specified in this Section.

B) Prepare pavement joints by saw cutting existing pavement a minimum of 1 foot beyond the damaged area.

(1) Apply a bond/tack coat at a rate of 0.10 gallons per square yard on all saw cut edges of existing pavement.

(2) Butt join new pavement to existing pavement.

3.5 COMPLETION REQUIREMENTS

A) Adjust castings to finish grade or to a maximum of 1/4 inch below finish grade of all manholes, catch basins, and valve boxes.

B) Sweep adjacent paved surfaces clean of all dirt and debris.

C) Repair any damage to existing pavement surfaces outside of areas receiving new pavement at no cost to the Owner.

D) Erect barricades to protect pavement from traffic until mixture has cooled enough to bear traffic loads without becoming marked or grooved.

E) Repair or replace all nonconforming Work.

3.6 FIELD QUALITY CONTROL

A) The Owner, at its sole discretion and cost, may engage a qualified testing agency to perform tests and inspections.

(1) Replace and compact asphalt where core tests have been taken.

B) Remove and replace or install additional asphalt where test results indicate that materials and/or installation do not comply with specified requirements.

END OF SECTION

SECTION 32 13 13 CONCRETE PAVING GENERAL

1.1 RELATED SECTIONS

A) Clearing and Preparation: Section 31 10 00 “Site Preparation”

B) Base Preparation: Section 31 20 00 “Earth Moving”

C) Pavement Marking Paint: Section 32 17 00 “Paving Specialties”

1.2 REFERENCES

A) ACI (American Concrete Institute)

(1) 301 “Specifications for Structural Concrete for Buildings”

B) ASTM (ASTM International)

(1) A615 “Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement”

(2) C94 “Standard Specification for Ready-Mixed Concrete”

(3) D1751 “Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)”

C) CRSI (Concrete Reinforcing Steel Institute)

(1) MSP-1 “Manual of Standard Practice”

(2) PRB-2 “Placing Reinforcing Bars”

D) MDOT (Michigan Department of Transportation)

(1) “Standard Specifications for Construction”

1.3 SUBMITTALS

A) Submit Product Data.

(1) Concrete pavement mix designs.

(2) Concrete sidewalk mix designs.

(3) Concrete admixtures.

B) Test Results.

(1) Base compaction test results.

(2) Concrete quality test results.

1.4 QUALITY ASSURANCE

A) Use ready-mixed concrete manufacturers who comply with ASTM C94.

B) Comply with ACI 301, as applicable, and unless more stringent requirements are indicated.

PART 2 PRODUCTS

2.1 MATERIALS

A) Sand/Gravel Base: Compacted base in accordance with Section 31 20 00 “Earth Moving.”

B) Concrete Formwork: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

(1) Use flexible or pre-curved forms for curves having a radius of less than 100 feet.

C) Form Release Agent: Commercially formulated form release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D) Concrete Reinforcement: Conforming to MDOT “Standard Specifications for Construction,” Section 905.

(1) Steel Reinforcing Bars: ASTM A615, Grade 60, deformed.

(2) Use smooth steel dowels where one-way movement between slabs is required.

E) Concrete: Conforming to MDOT "Standard Specifications for Construction," Section 601.

(1) MDOT Grade: P1.

(2) Minimum Concrete Strength at 28 days: 4,000 pounds per square inch.

(3) Air Entrainment: 4 to 8 percent.

(4) Slump: 4 to 5 inches.

(5) Maximum Water/Cement Ratio: 0.45.

(6) Aggregates: Use 100 percent crushed stone aggregate in order to eliminate materials containing substances that may cause spalling in finished concrete.

F) Curing Compound: Wax-based, membrane-forming curing compound for spray application.

G) Isolation Joints: Preformed joint filler complying with ASTM D1751.

(1) Joint Filler Dimensions: 1/2 inch thick by the depth of the slab, unless indicated otherwise.

(2) Approved Product: Homesote Company, "Homex 300."

PART 3 EXECUTION

3.1 PREPARATION

A) Perform all earth work necessary to conform to the finish grades indicated.

(1) Compact and grade subgrade soils to the correct elevations.

(2) Remove deleterious subgrade soil materials and replace with acceptable base materials.

(3) Place and compact base materials on top of subgrade as required to provide adequate pavement support and to raise elevations to correct grades.

(4) Prepare base in accordance with Section 31 20 00 "Earth Moving."

B) Set, brace, and secure edge forms, bulkheads, and intermediate screen guides for pavement to required lines, grades, and elevations.

C) Fabricate, place, and support concrete reinforcing in accordance with CRSI MSP-1 and CRIS PRB-2.

D) Measure, batch, and mix concrete materials in accordance with ASTM C94.

3.2 CONCRETE PAVEMENT INSTALLATION

A) No concrete paving is proposed as part of this project. The contractor may provide concrete pavement in lieu of asphalt pavement in strategic areas upon written approval from Owner.

B) Construct concrete pavement as indicated and in conformance with Division 6 of the MDOT "Standard Specifications for Construction."

C) Dimensions:

(1) Plan Dimensions: As indicated or as required to replace existing.

(2) Slab Thickness: 6 inches minimum (or greater if required to meet existing slab thicknesses or) or as designed be Engineer.

(3) Surface Slope: As indicated, sloping to facilitate drainage required, or as necessary to meet existing lines and elevations.

D) Joints: Place pavement joints at maximum spacing of 24 times the thickness of the slab, up to a maximum of 15 feet on center, each direction.

(1) Place minimum 1/2-inch-thick, continuous isolation joint strips at all locations where concrete pavements abut adjacent structures.

E) Reinforcement: Place welded wire fabric in all concrete pavements in accordance with MDOT "Standard Specifications for Construction."

F) Finishes: Broom finish or dragged-damp-fabric finish.

(1) Texture lines normal to the direction of travel (transverse, not parallel).

G) Curing: Spray curing compound on concrete surfaces immediately after finishing.

3.3 CONCRETE SIDEWALKS INSTALLATION

A) Construct concrete sidewalks in accordance with MDOT "Standard Specifications for Construction," Section 803.

B) Dimensions:

(1) Plan Dimensions: As indicated in Drawings or as required to replace existing.

(2) Slab Thickness for All Areas Except Drive Approaches: 4 inches minimum (or greater if required to meet existing slab thicknesses).

(3) Slab Thickness for Drive Approaches: 6 inches minimum (or greater if required to meet existing slab thicknesses).

(4) Surface Slope: Not less than 1/4 inch per foot, sloping to facilitate drainage required, or as necessary to meet existing lines and elevations; not greater than 1/4 inch per foot at landings; not greater than 1:20 along other walking surfaces (except where barrier-free ramp requirements are met).

(5) Place isolation joints at all intersections of concrete and other abutting structures.

C) Provide ½" inch expansion joints in pattern indicated and as follows:

(1) At ends of thickened sidewalks.

(2) At maximum spacing of 100 feet.

(3) Around permanent structures in sidewalks.

(4) Between backs of curbs and sidewalks.

(5) Where sidewalk ramps meet backs of curbs.

D) Provide plane of weakness joints as follows:

(1) At intervals equal to the sidewalk width or at a maximum 10 feet (whichever is less).

(2) In thickened sidewalks at the outer edges of driveways.

(3) Where permanent structures are located in sidewalks.

E) Provide minimum 1/2-inch-thick, continuous isolation joint strips at all locations where concrete sidewalks abut adjacent structures.

F) Finishes: Broom finish or dragged-damp-fabric finish.

(1) Texture lines normal to the direction of travel (transverse, not parallel).

G) Curing: Spray curing compound on concrete surfaces immediately after finishing.

3.4 CONCRETE SIDEWALK RAMPS AND APRONS INSTALLATION

A) Provide MDOT Type 1 or Type 3 sidewalk ramps at all locations where new sidewalks meet curbs.

B) Provide concrete aprons where driveways abut garage entrances.

(1) Follow MDOT "Standard Specifications for Construction," Section 803.

C) Dimensions:

(1) Length: As indicated.

(2) Width: 4 feet (unless indicated otherwise).

(3) Thickness: 6 inches (unless indicated otherwise).

D) Provide ½ inch wide expansion joints at intervals not exceeding 50 feet and between all abutting buildings and structures.

E) Provide control joints at intervals not exceeding 5 feet.

F) Finishes: Broom finish or dragged-damp-fabric finish.

(1) Texture lines normal to the direction of travel (transverse, not parallel).

G) Curing: Spray curing compound on concrete surfaces immediately after finishing.

3.5 COMPLETION REQUIREMENTS

A) Erect barricades to protect paving from traffic until concrete has cured enough to bear traffic loads without becoming marked or grooved.

(1) Exclude traffic from pavements for at least 14 days after placement, if feasible, with 7 days minimum.

B) Backfill and compact all voids after forms are removed.

C) Repair or replace all nonconforming Work.

3.6 FIELD QUALITY CONTROL

A) The Owner, at its own discretion and cost, may engage a qualified testing agency to perform tests and inspections.

B) Remove and replace concrete pavements where test results indicate that materials and/or installation do not comply with specified requirements.

END OF SECTION

SECTION 32 15 00 AGGREGATE SURFACING

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Excavation and Subbase Preparation: Section 31 20 00 “Earth Moving”

1.2 REFERENCES

A) ASTM (ASTM International)

(1) D1557 “Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3(2,700 kN-m/m^3))”

(2) D2922 “Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)”

B) MDOT (Michigan Department of Transportation)

(1) “Standard Specifications for Construction”

1.3 SUBMITTALS

A) Submit Test Results.

(1) Compaction test results and Aggregate Sieve Analysis

1.4 QUALITY ASSURANCE

A) Provide only fill and subbase materials approved by the Civil Engineer.

B) Base and Surfacing Compaction:

(1) Determine maximum density using the Modified Proctor Method, ASTM D1557, or by another method approved by the Engineer.

(2) Determine field, in-place density by the Nuclear Density Method, ASTM D2922, or by another method approved by the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

A) Aggregate Surface Material: MDOT 21AA white washed limestone aggregate.

PART 3 EXECUTION

3.1 PREPARATION

A) Protect existing surfaces outside of areas receiving new aggregate surfacing.

3.2 INSTALLATION

A) Place compacted aggregate surfacing material.

(1) Minimum Depth of Aggregate Surfacing, Compacted in Place: 6 inches.

(2) Minimum Compaction: 95 percent maximum density.

(3) Adjust moisture content as required to achieve required compaction.

B) Provide finish elevations and cross sections indicated in the Drawings and as required to provide smooth transitions and promote proper drainage.

3.3 COMPLETION REQUIREMENTS

A) Repair any damage to existing pavements and aggregate surfaces outside of areas receiving new work at no cost to the Owner.

B) Repair or replace all nonconforming Work.

END OF SECTION

SECTION 32 16 00 CURBS AND GUTTERS

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Clearing and Preparation: Section 31 10 00 “Site Clearing”

B) Base Preparation: Section 31 20 00 “Earth Moving”

1.2 REFERENCES

A) ASTM (ASTM International)

(1) D1751 “Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)”

B) MDOT (Michigan Department of Transportation)

(1) “Standard Specifications for Construction” [have internet pdf download from mdot website]

1.3 SUBMITTALS

A) Submit Product Data.

(1) Concrete curb and gutter mix designs.

(2) Concrete admixtures.

PART 2 PRODUCTS

2.1 MATERIALS

A) Concrete Reinforcement: Conforming to MDOT “Standard Specifications for Construction,” Section 8.05.

B) Concrete: Conforming to MDOT “Standard Specifications for Construction,” Section 6.08, 6.09, and 7.01.

(1) MDOT Grade: 35P.

(2) Concrete Strength: 3,500 pounds per square inch.

(3) Aggregates: Use 100 percent crushed stone aggregate in order to eliminate materials containing substances that may cause spalling in finished concrete.

C) Isolation Joints: Preformed joint filler complying with ASTM D1751.

(1) Joint Filler Dimensions: 1/2 inch thick by the depth of the slab, unless indicated otherwise.

(2) Approved Product: Homesote Company, “Homex 300.”

D) Sand Base: Compacted base in accordance with Section 31 20 00 “Earth Moving.”

PART 3 EXECUTION

3.1 PREPARATION

A) Perform all earth work necessary to conform to the finish grades indicated.

B) Prepare base in accordance with Section 31 20 00 “Earth Moving.”

3.2 CONCRETE CURB AND GUTTER INSTALLATION

A) Construct concrete curbs and gutters in accordance with MDOT “Standard Specifications for Construction,” Section 6.09.

(1) Provide curb and gutter of type and profile detailed.

(2) Provide curb openings as detailed, installed at existing driveways at the location of existing curb openings.

(3) Provide depressed curbs to 1-inch height at sidewalk ramps and driveway openings.

(4) Provide drop-pan curb (edge of metal grade is lower than gutter) at all Sections where adjacent pavement slopes away from curb.

B) Joints: Conforming to MDOT Standard Plan II-30 series.

C) Provide ½ inch wide expansion joints at the following locations:

(1) Saw-cut curb ends.

(2) Curb radius spring points.

(3) Approximately 10 feet each side of all catch basins.

D) Provide contraction joints at the following locations:

(1) Opposite all transverse contraction joints in adjacent concrete pavements.

(2) At 40-foot maximum intervals.

E) Finishes: Finish surfaces in accordance with MDOT “Standard Specifications for Construction,” Section 6.09.

3.3 COMPLETION REQUIREMENTS

A) Backfill and compact all voids after forms are removed.

B) Repair or replace all nonconforming Work.

END OF SECTION

SECTION 32 17 00 PAVING SPECIALTIES

PART 1 GENERAL

1.1 REFERENCES

A) AASHTO (American Association of State Highway Transportation Officials)

(1) M-248 “Standard Specification for Ready Mixed White and Yellow Traffic Paints”

B) ASTM (ASTM International)

(1) A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”

C) NEMA (National Electrical Manufacturers Association)

(1) TC2 “Electrical Polyvinyl Chloride (PVC) Conduit”

1.2 SUBMITTALS

A) Submit Product Data.

(1) Pavement marking paint.

PART 2 PRODUCTS

2.1 MATERIALS

A) Pavement Marking Paint: MDOT approved paints complying with AASHTO M-248.

(1) Color for Barrier-Free Symbols and Striping: Light blue.

(2) Color for Balance of Pavement Marking Paint: White.

B) Underground Utility Sleeves: Schedule 40 PVC piping per NEMA TC2.

(1) Minimum Sleeve Diameter: 4 inches, unless otherwise indicated.

(2) Provide pull tapes in each sleeve: mule tape or rope with a minimum tension capacity of 5,000 pounds.

(3) Provide tape or other sealing device suitable for preventing debris from entering sleeve ends.

(4) Provide marker stakes to identify the locations of buried sleeve ends.

C) Steel Pipe Bollards: Standard, schedule 40, black steel pipe per ASTM A53, concrete filled and set in concrete footing to minimum 3 feet below grade.

(1) Pipe Outside Diameter: 6 inches, unless indicated otherwise.

(2) Crown concrete at top of pipe to shed water off bollard.

(3) Provide primer and two-coat paint finish.

(4) Sleeves for Steel Pipe: steel pipe sized for snug fit of post outside diameter into sleeve inside diameter.

D) Wheel stops: Precast, air-entrained concrete, 2500 pounds per square inch minimum compressive strength.

(1) Dimensions: 4-1/2 inches high by 9 inches wide by 72 inches long.

(2) Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.

(3) Dowels: Galvanized steel, 3/4-inch diameter, 12-inch minimum length.

PART 3 EXECUTION

3.1 PAVEMENT MARKING PAINT INSTALLATION

A) Do not apply pavement-marking paint until layout, colors, and placement have been verified with the Owner and Architect.

B) Roadway Pavement Marking Installation: Apply pavement markings in accordance with the paint manufacturer's instructions, MDOT "Standard Specifications for Construction," and MDOT Publication 060 (MMUTCD) requirements, as applicable.

(1) Do not apply pavement markings to damp surfaces.

(2) Do not apply pavement markings when the surface temperature is less than 40 degrees Fahrenheit.

(3) Protect newly-applied traffic markings until paint is fully cured.

C) Parking Lot Pavement Marking Installation: Provide 4-inch-wide lane and parking striping, hatching, lettering, directional arrows, barrier-free and other symbols as shown in site plan drawings and as required by local Authorities Having Jurisdiction.

(1) Proceed with pavement marking only on clean, dry surfaces and at minimum ambient and surface temperatures as allowable by the paint manufacturer.

(2) Follow paint manufacturer's application instructions.

(3) Apply lane marking and parking striping in straight, uniform lines.

(4) Use accurately-cut templates for lettering, arrows, and symbols.

(5) Protect newly-applied traffic markings until paint is fully cured.

3.2 WHEEL STOPS

A) Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded at one-quarter to one-third points.

(1) Securely install dowels into pavement and bond to wheel stop.

(2) Recess head of dowel beneath top of wheel stop.

3.3 PIPE BOLLARD INSTALLATION

A) Anchor in concrete with pipe sleeves preset and anchored into concrete.

(1) Fill space between bollard and sleeve solidly with non-shrink, nonmetallic grout.

B) Anchor in place with concrete footings.

(1) Support and brace bollards in position in footing excavations until concrete has been placed and cured.

C) Anchor to existing construction with post-installed anchors and bolts.

(1) Provide four 3/4 inch anchors at each bollard, embedded at least 4 inches in existing concrete.

D) Fill bollards solidly with concrete, mounding top surface.

3.4 COMPLETION REQUIREMENTS

A) Repair or replace all nonconforming Work.

END OF SECTION

SECTION 32 23 23 FILL

PART 1 GENERAL

1.1 SUMMARY

A) Section Includes:

B) Backfilling building perimeter to subgrade elevations.

C) Backfilling site structures to subgrade elevations.

D) Fill under slabs-on-grade.

E) Fill under paving.

F) Fill for over-excavation.

1.2 RELATED SECTIONS:

A) Section 03 30 00 - Cast-In-Place Concrete: Concrete materials.

B) Section 31 05 13 - Soils for Earthwork: Soils for fill.

C) Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.

D) Section 31 22 13 - Rough Grading: Site filling.

E) Section 31 23 16 - Excavation.

F) Section 31 23 17 - Trenching: Backfilling of utility trenches.

G) Section 33 11 16 - Water Utility Distribution Piping.

1.3 REFERENCES

A) American Association of State Highway and Transportation Officials:

(1) AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B) ASTM International:

(1) ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

(2) ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

C) ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 MICHIGAN DEPARTMENT OF TRANSPORTATION (MDOT)

A) Manual for the Michigan Test Methods: MTM 107 – Sampling Aggregates

B) Manual for the Michigan Test Methods: MTM 108 – Percent Loss by Washing

C) Manual for the Michigan Test Methods: MTM 109 – Sieve Analysis

D) Density Testing and Inspection Manual: One Point T-99 Test

E) Density Testing and Inspection Manual: Michigan One Point Cone Test

F) Density Testing and Inspection Manual: Density In-Place (Nuclear) Test

1.5 SUBMITTALS

A) Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B) Product Data: Submit data for geotextile fabric indicating fabric and construction.

PART 2 PRODUCTS

A) FILL MATERIALS

(1) See Section 31 05 13 – Soils for Earthwork and Section 31 05 16 – Aggregates for Earthwork

PART 3 EXECUTION

3.1 EXAMINATION

A) Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B) Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C) Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A) Compact subgrade to density requirements for subsequent backfill materials.

B) Cut out soft areas of subgrade not capable of compaction in place. Backfill with granular material type A2 fill and compact to density equal to or greater than requirements for subsequent fill material.

C) Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A) Backfill areas to contours and elevations with unfrozen materials.

B) Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C) Place fill material in continuous layers and compact in accordance with Section 32 05 13 – Soils for Exterior Improvements and Section 32 05 16 – Aggregates for Exterior Improvements.

D) Employ placement method that does not disturb or damage other work.

E) Maintain optimum moisture content of backfill materials to attain required compaction density.

F) Backfill against supported foundation walls and other sound structural elements. Do not backfill against unsupported structures.

G) Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

H) Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

I) Make gradual grade changes. Blend slope into level areas.

J) Remove surplus backfill materials from site.

K) Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A) Section 01 40 00 - Quality Requirements: Tolerances.

B) See Section 31 22 13 – Rough Grading and Section 31 23 17 – Trenching.

3.5 FIELD QUALITY CONTROL

A) Section [01 40 00 - Quality Requirements] [01 70 00 - Execution and Closeout Requirements]: Field inspecting, testing, adjusting, and balancing.

B) Perform laboratory material tests in accordance with ASTM D1557, ASTM D698 and/or AASHTO T180 and appropriate or the corresponding Michigan Test Method.

C) Perform in place compaction tests in accordance with the following:

(1) Density Tests: ASTM D2922 and the procedures described in the MDOT Density Testing and Inspection Manual. Where conflicts arise, the ASTM standard shall prevail.

(2) Moisture Tests: ASTM D3017 and the procedures described in the MDOT Density Testing and Inspection Manual. Where conflicts arise, the ASTM standard shall prevail.

D) When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E) Frequency of Tests:

(1) Subsoil Fill: 1 Test per 200 CYD -or- 1 Test per 600 SYD/Layer

(2) Granular Fill: 1 Test per 100 CYD –or- 1 Test per 300 SYD/Layer

(3) Structural Fill: 1 Test per 50 CYD -or- 1 Test per 225 SYD/Layer

F) Proof roll compacted fill surfaces under slabs-on-grade, pavers, paving, and foundations.

3.6 SCHEDULES

A) Topsoil Fill:

(1) Fill Type S3: To finish grade at the thickness specified on the plans.

(2) Compact uniformly to minimum 90 percent of maximum density.

B) Subsoil Fill:

(1) Fill Type S1 and S2: To subgrade elevation. 12 inches thick.

(2) Compact uniformly to minimum 90 percent of maximum density

C) Granular Fill and Backfill:

(1) Fill Type A1 or A2: To subgrade elevation. 12 inches thick.

(2) Compact uniformly to minimum 95 percent of maximum density.

D) Structural Fill:

(1) Fill Type A2: To subgrade elevation. 8 inches thick.

(2) Compact uniformly to minimum 98 percent of maximum density.

3.7 PROTECTION OF FINISHED WORK

A) Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B) Reshape and re-compact fills subjected to vehicular traffic.

(1) Grade to design elevation, compact uniformly to 98 percent of maximum density.

END OF SECTION

SECTION 32 31 00 SITE FENCING

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Concrete Foundations for Fence Posts: Section 03 30 00 “Cast-In-Place Concrete”

1.2 REFERENCES

(1) ASTM (ASTM International)

(2) A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”

(3) B221 “Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes”

(4) A153 "Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware."

(5) A392 “Specification for Zinc-Coated Steel Chain Link Fence Fabric”

(6) A428 "Test Method for Weight of Coating on Aluminum-Coated Iron or Steel Articles."

(7) A585 "Specification for Aluminum-Coated Steel Barbed Wire."

(8) A824 “Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence”

1.3 SUBMITTALS

A) Gate Operator and Controls

(1) Submit Shop Drawings.

B) Fencing and Gates.

(1) Submit Shop Drawings.

PART 2 PRODUCTS

2.1 MATERIAL

A) Gate Motors and Controllers to be **“Linear – HSGL - 281”**, or approved equal. Motor to be ½ horsepower, 208 volt single phase motor. Gates shall be a minimum of 50% longer than the gate opening. Entire gate shall be covered with fabric. Install an Anti-Sway Truss on the inside of the gate. Rollers to be Premium Nylon Rollers with Sealed Ball Bearings. Top and Bottom Rollers must be installed with Safety Covers. System to be installed with a 6’ x 15’ Free Exit Loop Detector and a 6’ x 15’ Safety Loop Detector. Detectors to start 6’ inside and outside of the gates, respectively. Detector Loops to be installed in 1” PVC conduits in the gravel sub-base with a minimum of 2” of cover.

B) Fabric - The fence fabric shall be seven feet high, of a chain link construction of good commercial quality steel, No. 9 gauge (0.148 inch diameter) wire woven in a two inch diamond mesh. Aluminum coated steel wire with a minimum thickness of coating of 0.40 ounce/sq. ft. of wire surface or hot dipped galvanized after weaving to Class I weight of coating, not less than 2.0 ounces per square foot of actual wire surface covered, as checked by ASTM Test Method A428. Excessive roughness, blisters, sal ammoniac spots, bruises, or flaking may provide a basis for rejection. The fabric shall have a uniform diamond mesh approximately 2” between the parallel sides. Top and bottom selvages shall have a twisted and barbed finish. The steel wire shall have a minimum strength of 80,000 pounds per square inch after weaving. Fabric shall all be either a left-hand or right-hand weave with no splices.

C) Fabric Ties - Fabric ties shall consist of wires wrapping around the posts and the top rails, or clip for the post clamping around the flange of the post.

D) Wire - Wire shall be aluminum, No. 6 gauge wire, of sufficient ductility to wrap consecutively on its own diameter. Clip shall be galvanized steel, minimum No. 9 gauge.

E) Tension Wire - Tension wire shall be galvanized, spiraled or crimped, spring coil steel wire, 7 ga. diameter. Zinc coating shall be not less than 0.80 ounce per square foot of surface area. Tensile strength of coated wire shall be not less than 80,000 pounds per square inch.

F) Intermediate or Line Posts - Posts shall be ASTM A-120 steel, galvanized in accordance with ASTM A-123, 2 inch nominal diameter, weighing 3.65 pounds per linear foot.

G) End, Corner, and Pull Posts - Posts shall be galvanized steel in accordance with ASTM designation A-120 steel pipe, 2.50 inch nominal diameter (2.875" O.D. – 2.469" I.D.), or ASTM A501 standard weight, weighing 5.79 pounds per linear foot.

H) Top Rail - Top rail shall be 1-5/8" O.D. pipe weighing 2.27 lbs. per lineal foot.

I) Gate Posts - Gate posts shall be galvanized steel ASTM A501 standard weight steel pipe of the following sizes and weights for the listed gate widths:

Width of Gate Leaf	Outside Diameter in Inches	Weight in Pounds per Linear Foot
Under 10' incl.	4	9.11
Over 10'	6 5/8	18.97

J) Post Braces - The horizontal post brace shall consist of a galvanized steel pipe 1-5/8" O.D. weighing 1.8 lbs. per lineal foot, and a 5/16" truss rod and turnbuckle attachment.

K) Post Top - Post top shall consist of galvanized steel, ornamental or combination tops and barbed wire supporting arms, with a hole suitable for the through passage of the top rail. Galvanizing shall be in accordance with ASTM A153. The post top shall fit tightly over the post to prevent its removal by hand, and to exclude moisture from the interior of the post.

L) Expansion Sleeve or Rail Coupling - Expansion sleeve shall be of the outside type, consisting of a galvanized pipe at least 6" long, self-centering type. Expansion sleeves shall be used every 20 feet of top rail.

M) Stretcher Bar - Stretcher bar shall be galvanized steel flat bar, with square edges, measuring not less than 3/16" by ¾". The stretcher bar shall be arranged for attaching the fabric to all terminal posts by threading through the fabric. One stretcher bar shall be provided for each gate and post, and two for each corner and pull post.

N) Hog Ring - Hog ring shall be manufactured from 0.101" diameter galvanized steel wire.

O) Rail Ends - Rail ends shall be of galvanized steel of a diameter providing a tight fit for the top rail.

P) Barbed Wire - Each strand of barbed wire shall consist of two twisted strands of 12-1/2 USWG steel wire galvanized with a minimum zinc coating of 0.80 ounces per square foot of surface area, twisted together with 14 gauge, four point barbs at 5-inch maximum centers with a minimum zinc coating of 0.65 ounces per square foot of surface area.

Q) Brace and Tension Truss Rods - Brace and Tension truss rods shall be 3/8" diameter with turn-buckles for all braced panels and for all gate leaves.

R) Extension Arms - Extension arms shall be galvanized steel pressed or cast. The arm, unless one piece construction with the post top, shall be fastened to the base with two bolts to prevent its rotation. Barbed wire extension arms shall be attached to the base at a 45-degree angle with the topmost wire approximately 12" above the fabric and approximately 12" outward from the secured area (fence line). Barbed wire strands shall be spaced 6" apart. Extension arms shall be of sufficient strength to withstand a weight of 200lbs. applied at the outer strand of barbed wire with a deflection of less than ¼".

S) Bolts and Nuts - Bolts shall be 5/16" minimum in diameter, galvanized steel, carriage bolts, ASTM A307, Grade A bolts, minimum tensile strength 3100 lbs., coarse thread. Nuts shall be galvanized steel, ASTM A307, regular square head.

T) Gate Frame - Gate frame shall be fabricated with galvanized steel pipe. Pipe shall be 1-1/2" nominal diameter. Frame and intermediate members shall be of the same shape, joined together by welding. Sufficient number of intermediate members shall be used to provide a rigid construction of adequate strength, free from sag or twist.

U) Gate Hangers - Gate hangers shall be of fixed pin type, heavy duty hot-dip galvanized malleable iron.

V) Gate Locking - All gates shall have provisions for pad locks accessible from both sides of gate.

W) Plunger Bar and Center Stop - Plunger bar shall be tubular, approximately 24” long, galvanized steel. Center stop shall be a slotted dome latch base, and with the slot directly under the plunger when the gate is in closed position and parallel to the gate leaves. Plunger bar and center stop not required for single leaf gates or slide gates.

PART 3 EXECUTION

3.1 CODES, SPECIFICATIONS AND STANDARDS

A) Contractor shall furnish all labor, materials, transportation, tools and equipment and services necessary and incidental to install chain link fencing with fabric seven feet high and three strands of barbed wire above the fabric as specified herein. Fencing shall include all fabric, posts, gates, top and bottom rail, concrete foundations and all other items necessary for the complete installation.

B) Codes, specifications and standards (latest edition) referred to by number or title shall form a part of this section to the extent required by the references thereto.

C) Chain Link Fence Manufacturers Institute (CLFMI)

(1) Standard for Chain Link Fence Installation

(2) Specifications for Industrial Steel Chain Link Fence

(3) Industrial Steel Specification for Fence Posts, Gates and Accessories

D) Contractor shall lay out the work, establishing all construction lines and levels with surveying instruments, and shall be responsible for correct locations, elevations and positions of all parts of the work. *Contractor* shall use the benchmarks indicated to establish elevations shown on the drawings.

E) Contractor may furnish an equivalent item as a substitute for the one required by this specification, providing it has the same function, strength, material, and is approved in writing by *Owner*. Every request for substitution shall be made in conjunction with the bid proposal. No substitution will be permitted after the work is awarded. *Contractor* shall furnish to *Owner*, if requested, drawings of the items they wish to substitute as equivalents.

F) Each roll of fabric shall carry a tag showing the steel alloy number, kind of coating, class of coating, gauge of the wire, length of fencing in the roll, and the name or mark of the manufacturers. Posts, wire and other fittings shall be identified by the steel alloy number.

3.2 INSTALLATION OF CHAIN LINK FENCE

A) Installation shall be made by skilled mechanics experienced in the erection of this type of fence. The fence shall be erected on lines and to grades as shown on the drawings.

B) If the fence is being relocated on a site that had been enclosed, the site and any territory added to the site must be completely enclosed at the end of each working day

C) Concrete foundations shall be provided at all posts as shown on the drawings.

D)

E) Posts shall be installed vertically. Line posts shall be evenly spaced in the line of fence no farther apart than 10 feet on centers.

F) The fabric shall be stretched to proper tension between terminal posts and securely fastened to framework members. Fabric shall be fastened to all terminal posts with tension bars and bands. There shall be one band for each foot of height of the fence. Fabric for the fence shall all be either a left-hand or right-hand weave. Rolls of fabric shall be joined together by weaving a single strand into the end roll to form a continuous piece of fabric. The bottom of the fabric shall extend down to the finish grade with a maximum gap of 2". The fabric shall be fastened to all posts with fabric ties spaced approximately 12" apart and to top rail with the ties on approximately 24" on centers.

G) All foundations shall be concrete, consisting of 1 part Portland cement, 2 parts sand, and 4 parts gravel. Water content shall not exceed 6 gallons per sack of cement. Slump as measured by

standard ASTM test C143 shall not exceed 3-1/2 inches. They shall be crowned at the top to shed water from the post. Concrete shall be poured in straight-sided holes with precautions taken to avoid mushrooming or spillover at the top.

H) Where solid rock is encountered before reaching the required depth previously specified, line posts shall be set at a minimum depth of 12 inches; end, corner, gate, and pull posts, at a minimum depth of 18 inches into the solid rock. The hole shall have a minimum width one inch greater than the largest dimension of the post section to be set. After the post is set and plumbed, the hole in the solid rock shall be filled with grout consisting of one part Portland cement and three parts clean, well graded sand. Other grouting materials may be used if approved by *Owner*. The grout shall be crowned to shed water from the post.

I) Barbed Wire Extension Arm - Barbed wire extension arms shall be mounted at a 45-degree angle from the vertical height of one foot above the top of the fabric; the extension arms shall be perpendicular to the fence line. The extension arm base may be of post clamping type by means of a bolt, or of the type which slip on the end of the post. If this second type of arm is used it shall be mounted tightly on the post to prevent rocking of the arm, and its removal by hand. The arm base shall be shimmed whenever necessary to prevent this condition to occur. Barbed wire shall overhang the outside of the fence including corners unless otherwise noted. At the gate posts and gates the extension arm shall be vertical.

J) Barbed Wire Installation - Barbed wire shall be tensioned between corner, pull, or terminal posts, by mechanical means to remove all sag. Barbed wire shall be inserted in the slots of the extension arms and anchored at the terminal posts. Hand tightening will not be permitted. A pull post shall be used at a distance not exceeding 500 feet.

K) Barbed wire shall be secured to the arm by means of a continuous galvanized steel wire tie, looped twice around each strand, on the inside of the arm.

L) The top rail shall pass through the base of the line post tops and form a continuous brace from end to end of each stretch of fence by installation of outside sleeve couplings at approximately 20 feet on centers. Top rail shall be securely fastened to the terminal post by galvanized steel rail end castings, and brace bands.

M) Bottom tension wire shall be tensioned, from terminal post to terminal post to the maximum of its tensioning capacity, by mechanical means. Its elevation above grade line shall correspond to the middle of the fabric bottom diamond. Tension wire shall be installed on the inside of the intermediate posts and fastened to every post with a tie looped twice around the wire. It shall be fastened to the fabric with hog rings located 6” from each side of the posts and every 24” maximum for the remaining distance to the next post.

N) Fabric Tie - If tie wires are used to fasten the fabric to intermediate posts they shall be spaced not more than 12” apart. Fabric shall be tied to the top rail with galvanized steel tie wires, spaced not more than 24” apart. Each end of the fabric tie shall be twisted at least twice around the fabric wire with no ends of the tie left untwisted. If a clip is used to fasten the fabric to the flange of the H post, its ends should be in complete contact with the flange of the H post, when the clip is in place.

O) All gates shall be sliding gates unless otherwise specifically noted. Maximum clearance between the gate fence and gate post shall be 1-1/2”.

P) Post braces shall be provided for each gate, corner, pull and end post. They shall consist of a pipe installed horizontally 12” below the top rail extending to each adjacent post, and a diagonal rod from the line post to the base of the gate, corner, pull, or end post, with a turnbuckle or other equivalent adjustment.

Q) Touch-up paint for fencing shall be "Zinkote" as manufactured by the "Amercoat Corporation," or equal.

R) Safety Provisions - Wherever irregularities in the ground prevent maintaining the maximum 2” clearance between the bottom of chain link fabric and the ground, the distance between posts shall be reduced as required to meet this space clearance. Where transverse culverts, troughs, or other openings larger than 96 square inches are present, *Contractor* shall fabricate an obstruction of bar and grill type meeting *Owner’s* approval.

Wolverine Property Perimeter Fence Installation

EXHIBIT A

SCOPE OF WORK

Fencing Material: See individual location maps to determine fence material to be used.

Woven Wire

- High tensile field fence 4 feet in height
- 12½ gauge (or stronger) field fence
- 6 inch horizontal spacing
- Minimum of class 3 galvanizing
- Alternate fencing styles/materials may be used upon Wolverine approval

Smooth Wire

- High tensile smooth wire - four (4) strands at 12″, 24″, 36″, 48″ above ground height
- 12½ gauge (or stronger) high tensile wire with 200,000 PSI breaking strength
- Minimum class 3 galvanizing
- Alternate fencing styles/materials may be used upon Wolverine approval

Cedar Round Post and Round Rail

Install at specified high-visibility areas, such as road frontage or adjacent residential properties.

- Cedar Round Posts 8 foot in height set approx. 5 feet above grade and 3 feet below grade placed in the ground with tamped earth
- Cedar Round Rails
  - 2 rails per section at 2′ & 4′ in ht. above grade
  - 8’ to 10’ in length
  - Secured to the posts with mortise and beveled tenon. The mortise is typically performed in the field with a special drill bit to ensure the accurate placement of the rail height
- See photo example of the round cedar fence

End Posts, Corner Posts and Braces for woven wire and smooth wire construction are to use H style braces using 5 inch or greater top diameter by 8 foot long or longer rounded wooden posts that have been pressure treated with a lumber preservative. All end posts, corner posts and brace posts shall be set 36 inches or greater in the ground with tamped earth or in concrete. See the photo example of typical corner bracing; representative only.

Line Posts are to be metal studded T-posts (1.25 lb/ft) 6½ foot in height or taller and spaced approximately 15 to 20 feet apart.

Fence Line shall run approximately 6" to 12" inside of Wolverine's property line when fence location is to be located at the property line and use survey pins as the guides. Wolverine shall ensure all fencing locations shall have survey pins and/or staked locations for reference. All lines shall run in a straight line between the survey pins and/or staked locations. Minor brush and grasses that interfere with the construction shall be removed by Contractor. Dense brush and trees that interfere with the construction shall be removed by Wolverine.

Gates: Ingress/egress locations that require gates are identified on the location maps. Gates shall be 16 gauge or stronger metal farm type gates approximately 4 feet in height. Openings shall be 20 to 24 feet in width with double 10

foot or double 12 foot gates installed on the fence end post braces. Gate locations are identified on the plans for each location. An example of standard gates are available at local Tractor Supply Stores with SKU #360310899 or SKU #360311699. Equivalent or stronger gates may be used upon Wolverine approval.

MISS DIG: Contractor shall be responsible for contacting MISS DIG prior to any fence construction project.

Workmanship Warranty: Unless otherwise provided in the specifications or our Agreement, Contractor hereby warrant that all work performed, (or to be performed), is in accordance with requirements of this Agreement and free from defective or inferior materials, equipment, and workmanship for a period of one (1) year after the date of notice of completion, being the date of final invoice. If within the warranty period, Wolverine or Contractor finds that warranted work needs to be repaired or changed because the materials, equipment, or workmanship were inferior, defective, or not in accordance with the requirements of the Agreement, then Contractor agrees to promptly and without additional expense to Wolverine and within time limits established by the Agreement:
1) Place in satisfactory conditions all of the warranted work;
2) Satisfactorily correct all damage to fencing equipment or material that is the result of such unsatisfactory work.

END OF SECTION

SECTION 32 91 19 LANDSCAPE GRADING

PART 1 GENERAL

1.1 SUMMARY

A) Section Includes:

(1) Final grade topsoil for finish landscaping.

(2) Soil testing.

1.2 RELATED SECTIONS:

A) Section 31 20 13 – Earth Moving

B) Section 32 92 19 - Seeding.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

A) Topsoil, 4 inches.

(1) Basis of Measurement: By square yard.

(2) Basis of Payment: Includes supplying topsoil materials, stockpiling, preparing and scarifying substrate surface, placing where required to the specified depth, and rolling.

(3) Basis of Application: This pay item shall apply on all projects where included on the Bid Form, generally used when topsoil depth will be constant.

1.4 SUBMITTALS

A) Section 01 32 19 - Submittal

B) Samples: Submit, in air-tight containers, 5 lb. sample of topsoil to testing laboratory.

C) Testing Report: Submit to Owner the laboratory testing report with nutrient and pH levels with recommended soil supplements and application rates.

D) Materials Source: Submit name and location of imported materials source.

1.5 QUALITY ASSURANCE

A) Furnish topsoil material from single source throughout the Work.

PART 2 PRODUCTS

2.1 MATERIAL

A) Topsoil:

(1) Imported borrow.

(2) Friable loam.

(3) Free of roots, rocks larger than ½", subsoil, debris, weeds, soil clumps larger than 1 inch, and foreign matter.

(4) Screening: Double screened.

(5) Acidity range (pH) of 5.5 to 7.5.

(6) Containing minimum of 4 percent and maximum of 25 percent organic matter.

(7) Conforming to ASTM D2487 Group Symbol PT

(8) Limit decaying matter to 5 percent of total content by volume.

2.2 SOURCE QUALITY CONTROL

A) Quality Requirements: Testing, inspection and analysis requirements.

B) Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C) Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

D) Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

A) Verification of existing conditions before starting work.

B) Verify all utility construction is complete.

C) Verify substrate base has been contoured and compacted.

3.2 PREPARATION

A) Protect landscaping and other features remaining as final Work.

B) Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

3.3 SUBSTRATE PREPARATION

A) Eliminate uneven areas and low spots.

B) Remove debris, roots, branches, and stones, in excess of 1/2 inch in size. Remove contaminated subsoil.

C) Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.4 PLACING TOPSOIL

A) Place topsoil to nominal depth of 4 inches unless specified otherwise on the plans.

B) Place topsoil during dry weather.

C) Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.

D) Remove roots, weeds, rocks, and foreign material while spreading.

E) Manually spread topsoil close to plant material and buildings to prevent damage.

F) Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage. Make all grade changes gradual.

G) Lightly compact placed topsoil with smooth roller not exceeding 100 lbs per linear foot.

H) Remove surplus subsoil and topsoil from site.

I) Leave stockpile area and site clean and raked, ready to receive landscaping.

3.5 PLACING HARDWOOD MULCH

A) All plantings shall be mulched within 5 days after planting.

B) Areas to receive mulch shall be graded so that the mulch, after settlement to the specified depth shall be level with the adjacent finish grades.

3.6 TOLERANCES

A) Top of Topsoil: Plus or minus 1/2 inch.

3.7 PROTECTION OF INSTALLED WORK

A) Prohibit construction traffic over topsoil.

END OF SECTION

SECTION 32 92 19 SEEDING

PART 1 GENERAL

1.1 DESCRIPTION

A) Section Includes:

(1) Fertilizing.

(2) Seeding.

(3) Hydroseeding.

(4) Mulching.

(5) Maintenance.

1.2 RELATED SECTIONS:

A) Section 31 20 00 – Earth Moving.

B) Section 32 91 19 - Landscape Grading.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

A) Fertilize and Seed

(1) Basis of Measurement: By square yard.

(2) Basis of Payment: Includes rolling, raking, seed and fertilizer materials and application.

B) Erosion Fabric

(1) Basis of Measurement: By square yard.

(2) Basis of Payment: Includes material, installation, maintenance, and repair or replacement.

1.4 REFERENCES

A) ASTM International:

(1) ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.5 DEFINITIONS

A) Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.6 SUBMITTALS

A) Section 01 32 19 – Submittals

B) Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

C) Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.7 CLOSEOUT SUBMITTALS

A) Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals. ???

B) Operation and Maintenance Data: Submit recommended type, application frequency, and recommended amount of fertilizer.

1.8 QUALITY ASSURANCE

A) Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

1.9 QUALIFICATIONS

A) Seed Supplier: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

B) Installer: Company specializing in performing work of this Section with minimum three years documented experience, approved by Owner.

1.10 DELIVERY, STORAGE, AND HANDLING

A) Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B) Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A) Seed Mixture

Seed Mixture: Type	Percent (by weight)
Kentucky Blue Grass	40 percent
Baron Bluegrass	10percent
Creeping Red Fescue Grass	30 percent
Perennial Rye	20 percent

(1) Utilize disease resistant Kentucky Bluegrass Varieties

2.2 ACCESSORIES

A) Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B) Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil, to the following proportions: Nitrogen 34 percent, phosphoric acid 33 percent and soluble potash 33 percent. Concentration will determine application rate.

C) Lime: ASTM C602, Class T agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

D) Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

E) Erosion Fabric: 100 percent straw fiber stitched with biodegradable thread to a biodegradable top net

(1) Products:

(a) North American Green S75BN

(b) Substitutions: To Be Approved by Engineer or Owner prior to application.

F) Herbicide: suitable for elimination of weeds and harmless to grass species specified.

G) Stakes: As recommended by erosion fabric manufacturer.

H) String/Netting: Biodegradable netting and fiber.

2.3 SOURCE QUALITY CONTROL

A) Testing, inspection and analysis requirements.

B) Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C) Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

D) Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

A) Verification of existing conditions before starting work.

B) Verify utility work and improvements are complete.

C) Verify relocation of fixed improvements (including mailboxes) is complete.

D) Verify prepared topsoil is ready to receive the Work of this Section.

3.2 FERTILIZING

A) Apply lime at application rate recommended by soil analysis.

B) Apply fertilizer at application rate recommended by soil analysis.

(1) Apply after smooth raking of topsoil and prior to roller compaction.

C) Mix fertilizer thoroughly into upper 2 inches of topsoil.

D) Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 HYDROSEEDING

A) Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 30lbs per 1000 sq. ft. evenly in one pass.

B) Hydroseed slurry shall contain 240 lbs. per acre of seed and the appropriate amount of fertilizer as specified herein.

C) After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

D) Hydroseeding may only be performed from June 1 through September 1 or as specified by the ENGINEER unless irrigation systems will be installed for the seeded area.

3.4 SEEDING (WHERE HYDROSEEDING NOT USED)

A) Apply seed at rate of 220 lbs. per acre evenly in two intersecting directions. Rake in lightly.

(1) Do not seed areas in excess of that which can be mulched on same day.

(2) Planting Season: April 15 through October 10.

B) Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

C) Roll seeded area with roller not exceeding 100 lbs./linear foot.

D) Immediately following seeding and compacting, install erosion fabric. Maintain clear of shrubs and trees.

E) Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.5 SEED PROTECTION

A) Cover all non-hydroseeded areas with erosion fabric. Roll fabric onto surface without stretching or pulling. Cut to fit irregular shapes

B) Cover all seeded slopes where grade is 1 vertical to 3 horizontal or greater,

(1) Roll fabric horizontally onto slopes, beginning at bottom of slope.

(2) Lay fabric smoothly on surface, bury top end of each Section in 6-inch-deep excavated topsoil trench.

(3) Overlap edges and ends of adjacent rolls minimum 12 inches.

(4) Backfill trench and rake smooth, level with adjacent soil.

C) At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

D) Secure with stakes.

(1) Around perimeter of each piece, including outside edge and overlaps, spacing between stakes shall not exceed 36 inches.

(2) Staking pattern and spacing: follow manufacturer's recommendation.

(3) Install additional stakes on steep slopes.

E) Lightly dress with topsoil to ensure close contact between fabric and soil.

END OF SECTION

SECTION 33 16 00 STORAGE TANKS

PART 1 GENERAL

1.1 SCOPE

A) This Section includes underground fire protection standby water storage.

1.2 SUBMITTALS

A) Submit under provisions of Section 01 30 00 - Administrative Requirements.

B) Submit manufacturer's data sheets on each product to be used, including, but not limited to, the following:

(1) Preparation instructions and recommendations.

(2) Storage and handling requirements and recommendations.

(3) Installation manual and operating guidelines.

(4) Warranty: Provide manufacturer's standard limited warranty.

C) Tank manufacturer shall submit the following for review and approval prior to fabrication of the tanks:

(1) Detailed shop drawings of each tank complete with all accessories supplied by the manufacturer.

(2) Detailed shipping, handling and installation instructions.

1.3 QUALITY ASSURANCE

A) Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A) General: Comply with tank manufacturer's Installation and Operating Guidelines recommendations for delivery, storage, and tank handling.

1.5 WARRANTY

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A) Xerxes Corporation, which is located at: 1420 Parsons Rd. S.W.; Edmonton, AB, Canada T6X 1M5; Toll Free Tel: 800-661-8265

B) Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 UNDERGROUND WATER TANKS

A) Tank Design - Fiberglass reinforced plastic (FRP) tanks:

(1) The tank size, fittings and accessories shall be as shown on the drawings.

(2) Tank shall be manufactured with structural ribs which are fabricated as in integral part of the tank wall.

(3) Tank shall be manufactured with a laminate consisting of resin and glass fiber reinforcement only. No sand/silica fillers or resin extenders shall be used.

(4) Tank shall be vented to atmospheric pressure.

(5) Tank shall be capable of handling liquids with specific gravity up to 1.1

(6) Tank shall be compatible with liquids identified in the manufacturer's standard limited warranty.

B) Loading Conditions - Tank shall meet the following design criteria:

(1) Internal Load Tank shall be designed to withstand a 5-psig (35 kPa) air-pressure test with a 5:1 safety factor.

(2) Surface Loads Tank shall be designed to withstand surface H-20 and HS-20 axle loads when properly installed according to manufacturer's current Installation Manual and Operating Guidelines.

(3) External Hydrostatic Pressure Tank shall be designed for 7 feet (2.1 m) of overburden over the top of the tank, the hole fully flooded, and a safety factor of 5:1 against general buckling

C) Fire Protection Standby Water Storage Applications:

(1) Governing Standards, as applicable:

(a) ANSI/AWWA D120 - Thermosetting Fiberglass-Reinforced Plastic Tanks.

(b) American Concrete Institute (ACI) standard ACI 318, Building Code Requirements for Structural Concrete.

(c) ** NOTE TO SPECIFIER ** Delete if project is not in the U.S.

(d) NFPA 22: Standard for Water Tanks for Private Fire Protection.

(e) NFPA 1142: Standard for Water Supplies for Suburban and Rural Fire Fighting.

(f) Tank manufacturer shall be recognized by Underwriters Laboratories (UL) as a manufacturer of tanks listed to the UL 1316 standard.

(g) ** NOTE TO SPECIFIER ** Delete the following two standards if the project is not in Canada.

(h) National Fire Code of Canada.

(i) Tank manufacturer shall be recognized by Underwriters Laboratories of Canada as a manufacturer of tanks listed to the ULC S615 standard.

(2) Tank Design: Single-Wall vessel as specified and shown on the drawings.

(3) Tank Accessories - Fire Protection Standby Water Storage Applications:

(a) Tank Anchoring
1. Anchor straps shall be as supplied by tank manufacturer and designed for a maximum load of 25,000 lbs (11340 kg).
2. Galvanized turnbuckles shall be supplied by the tank manufacturer.
3. Prefabricated concrete anchors shall be supplied by the tank manufacturer, designed to the ACI 318 standard, manufactured with 4,000 psi concrete and shall have adjustable anchor points.

(b) Access Openings:
1. All access openings shall have a diameter of 24 inches or 30 inches, complete with riser, lid and necessary hardware.

(c) Attached Access Risers:
1. Attached access risers shall be PVC or FRP as supplied by tank manufacturer.
2. Attached access risers shall be 24-inch or 30-inch-diameter
3. Access risers shall be attached to access openings during installation utilizing adhesive or FRP bonding kits as supplied by the tank manufacturer.

(d) Piping and Fittings:

1. Tank shall be equipped with factory-installed threaded fittings, or pipe stubs.
2. PVC piping shall at a minimum meet the requirements of ANSI Schedule 40.
3. All flanged nozzles shall be flanged and flat-faced, and conform to Class 150 bolting patterns as specified in ANSI/ASME/ B16.5.
4. Carbon steel and stainless steel NPT fittings shall withstand a minimum of 150 foot-pounds (203 NM) of torque and 1,000 foot-pounds (1356 NM) of bending, both with a 2:1 safety factor.

(e) Manway Openings:
1. The standard manway shall be flanged, 22 inches (559 mm) I.D. and complete with gaskets, bolts and cover.
2. Manway openings shall be designed to withstand 5-psig (35 kPa) test pressure with a 5:1 safety factor.

(f) Ladders:
1. Ladders shall be the standard FRP ladder as supplied by tank manufacturer.

(g) Pump Platforms:
1. FRP pump platforms shall be supplied by tank manufacturer.

(h) Internal Piping
1. All internal piping shall be supplied by tank manufacturer.
2. All FRP nozzles for fire pump supply shall have an anti-vortex plate factory installed.

(i) Suction/Fill tubes:
1. Vertical draft/fill tubes shall be a minimum of PVC SCH 40 or FRP.
2. Vertical draft /fill tubes shall be factory installed.
3. Vertical draft /fill tubes shall terminate 4 inches (102 mm) above the bottom of tank.
4. Vertical draft tubes shall have anti-vortex plate factory installed.

PART 3 EXECUTION

3.1 TESTING

A) Tank shall be tested according to the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.

3.2 INSTALLATION

A) Tank shall be installed according to the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.

END OF SECTION

SECTION 33 20 00 WELLS

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Site Clearing for Utilities Installations: Section 31 10 00 “Site Preparation”

B) Utility Trenching: Section 31 20 00 “Earth Moving”

C) Excavation, Backfill, and Compaction for Utilities: Section 31 20 00 “Earth Moving”

D) Sleeves for Utilities Running Under Pavements: Section 32 17 00 “Paving Specialties”

E) Landscape Irrigation: Section 32 80 00 “Irrigation”

F) Water Mains: Section 33 10 00 “Water Utilities”

G) Sanitary Sewers and Appurtenances: Section 33 30 00 “Sanitary Sewerage Utilities”

H) Storm Water Management: Section 33 40 00 “Storm Drainage Utilities”

1.2 REFERENCES

A)

1.3 SUBMITTALS

A) Well size and pump specifications prior to installation.

B) Well and pumping records after installation.

1.4 QUALITY ASSURANCE

A) Install all underground utility lines as indicated on the drawings and as required for a complete utility service to the Project as designed.

(1) Comply also with the requirements of mechanical, electrical and plumbing Drawings and Specifications.

B) Coordinate utilities installations with the Owner and with the utility services providers applicable to the Project.

(1) Obtain all permits and approvals for site utilities installations. Owner to secure health department permits.

(2) Initiate, arrange for, and schedule utilities installations well in advance of the time they are needed to avoid construction or Project completion delays due to lack of availability of utility services.

C) Document the location of all underground utility line locations.

(1) Identify the ends of underground sleeves on the Project Site with marker stakes.

(2) Record, label, and dimension all underground utility line locations on the Record Project Drawings.

D) Provide all utility work in conformance with the standards, specifications and details of the local Authorities Having Jurisdiction.

(1) Where specifications or details differ between these Contract Documents and the standards of applicable Authorities Having Jurisdiction, comply with the more stringent requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A) Domestic (Potable) Water Piping:

(1) Diameter: Installer to make recommendation and submit for approval by Engineer prior to installation.

B) Water Wells: As specified and approved by the Authorities Having Jurisdiction.

C) Well Pumps: Installer to make recommendation and submit for approval by Engineer prior to installation.

D) Water Valves: Per design drawings

2.2 ACCESSORY MATERIALS

A) Provide all accessory materials and appurtenances required for complete and proper utilities installations, including, but not limited to, connectors, valves, taps, meters, gaskets, and sealants.

PART 3 EXECUTION

3.1 PREPARATION

A) Notify “Miss Dig” at least 3 working days prior to subsurface excavation or construction.

(1) Telephone Number: (800-482-7171).

B) Do not interrupt utilities serving facilities occupied by Owner or others without at least 48 hours prior notice.

(1) Provide temporary utility services where needed utility services are interrupted for an extended length of time (minimum 4 hours during regular business hours, 24 hours otherwise), as directed by the Owner.

C) Provide all site clearing required for utilities installations.

(1) Follow Specification Section 31 10 00 for clearing activities.

(2) Do not clear or damage trees and other existing landscape features without prior approval of the Owner.

3.2 WATER WELLS

A) Provide functioning domestic (potable), private water wells sized and installed in accordance with the site subsurface, hydrological, and service requirements of the Project.

(1) Follow the procedures, requirements, design details, and specifications dictated by the Health Department having jurisdiction.

(2) Test water for purity and provide the Owner with a copy of the test results indicating that the water is potable and acceptable for domestic uses.

(3) Minimum Piping Burial Depth: 6 feet below grade.

END OF SECTION

SECTION 33 31 13 SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.1 DESCRIPTION

A) Section Includes:

(1) Sanitary sewer pipe and fittings

(2) Underground pipe markers

(3) Connection to existing manholes.

(4) Wye branches

(5) Laterals and fittings

(6) Cleanouts

(7) Concrete encasement and cradles.

(8) Bedding and cover materials

B) Related Sections:

(1) Section 31 23 17 – Trenching.

(2) Section 33 01 32 – Sewer and Manhole Testing.

(3) Section 33 05 14 – Manholes and Structures.

1.2 REFERENCES

A) American Association of State Highway and Transportation Officials:

(1) AASHTO M306 – Standard Specification for Drainage, Sewer, Utility, and Related Castings.

B) ASTM International:

(1) ASTM A48/A48M - Standard Specification for Gray Iron Castings.

(2) ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

(3) ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).

(4) ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

(5) ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

(6) ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

(7) ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

(8) ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

(9) ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

(10) ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

(11) ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

(12) ASTM F1336 - Standard Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings.

C) American Water Works Association:

(1) AWWA C104 - ANSI Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

(2) AWWA C105 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.

(3) AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water.

(4) AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

(5) AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.

(6) AWWA C150 - ANSI Standard for Thickness Design of Ductile Iron Pipe.

(7) AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.

(8) AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water

(9) AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

1.3 SUBMITTALS

A) Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B) Product Data: Submit pertinent data indicating proposed materials, accessories, details, and construction information.

C) Reports: Submit reports indicating field tests made and results indicating conformance or non-conformance with specifications.

D) Manufacturer's Installation Instructions:

(1) Indicate special procedures required to install Products specified.

(2) Submit detailed description of procedures for connecting.

E) Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A) Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B) Project Record Documents: Accurately record actual locations of pipe runs, connections, manholes, and invert elevations.

(1) For all mains record length of pipe run, invert elevations and slope.

(2) For all laterals record:

(a) Y+ (distance from the downstream manhole to the wye fitting).

(b) E+ (distance measured along the lateral centerline to the lateral end).

(c) L (perpendicular distance from the lateral end to main).

(d) Two witness dimensions from the cleanout to a permanent structure.
1. Use manholes, catch basins, valves, hydrants, or property corners.
2. Do not witness to trees or building corners.

(3) Identify and describe any alterations made due to subsoil conditions, discovery of uncharted utilities, or unanticipated conditions.

1.5 QUALITY ASSURANCE

A) Manufacturer Qualifications: Company specializing in manufacturing Products specified in this section.

B) Installer Qualifications: Company specializing in performing work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

A) Section 01 60 00 - Product Requirements.

B) Block individual and stockpiled pipe lengths to prevent moving.

C) Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

D) Do not place pipe flat on ground. Cradle to prevent point stress.

E) Store UV sensitive materials out of direct sunlight.

1.7 FIELD CONDITIONS

A) Verify field measurements and elevations are as indicated on drawings.

(1) Measure invert elevations of existing downstream sewer at proposed connection point.

(2) Measure elevation of existing pipes at proposed crossing locations.

(3) Calculate proposed pipe slopes and verify clearance at crossings.

(4) Notify Engineer of any discrepancies.

B) Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPE AND FITTINGS

A) Plastic Pipe: ASTM D3034, Poly Vinyl Chloride (PVC) material; bell and spigot style rubber ring sealed gasket joints.

(1) Wall Thickness:

(a) SDR 35 for pipe buried 0-12 feet deep.

(b) SDR 26 for pipe buried over 12 feet deep.

(2) Fittings: ASTM F1336, PVC, of same wall thickness as pipe.

(3) Joints: ASTM D3212, elastomeric seals.

B) Ductile Iron Pipe: AWWA C151.

(1) Bituminous outside coating: AWWA C151.

(2) Interior Lining: Protecto 401 Ceramic Epoxy, thickness per manufacturer

(3) Pipe Thickness Class: AWWA C150, thickness class 52.

(4) Joints:

(a) Mechanical and Push-On Joints: AWWA C111.

(b) Flanged Joints: AWWA C115.

(c) Rubber Gaskets: AWWA C111. Locking gaskets not permitted.

(5) Fittings: AWWA C110, ductile-iron fittings or AWWA C153, ductile-iron compact fittings.

(a) Coating and Lining:
1. Bituminous Coating: AWWA C110.
2. Interior Lining: Protecto 401 Ceramic Epoxy, thickness per manufacturer

(b) Joints: AWWA C111, mechanical joints.

(6) Polyethylene Encasement: AWWA C105 polyethylene jacket.

(7) Electrical Conductivity: Provide copper conductivity straps, factory welded to pipe ends with field installed jumper strap and silicon-bronze bolts.

2.2 FLEXIBLE COUPLINGS

A) Manufacturers:

(1) Fernco Inc.

(2) Mission Rubber Company.

(3) NDS Inc.

(4) Substitutions: Section 01 60 00 - Product Requirements

B) Flexible Coupling: ASTM C1173, Resilient chemical-resistant elastomeric polyvinyl chloride coupling, two stainless steel clamps and stainless steel screws and housings.

2.3 CLEANOUTS

A) PVC body with PVC threaded plug.

B) Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.4 CLEANOUT RISER COVERS

A) Products:

(1) East Jordan Iron Works: Model 3675.

(2) Substitutions: Section 01 60 00 – Product Requirements

B) ASTM A48, Class 35B grey cast iron or ASTM A536 ductile iron construction.

C) Lid:

(1) Machined flat bearing surfaces.

(2) Removable.

(3) Lockable.

(4) Load rating of 40,000 lbs. in accordance with AASHTO M306.

D) Painting: Not allowed.

2.5 UNDERGROUND PIPE MARKERS

A) Products:

(1) Trace Wire:

(a) Copperhead Industries, LLC: Reinforced Tracer Wire™.

(b) Substitutions: Not permitted.

(2) Ball Markers:

(a) 3M: EMS iD Ball Marker - Wastewater 1424-XR/iD.

(b) Substitutions: Not permitted

B) Trace Wire: Magnetic detectable conductor, 30 mil green colored plastic covering, #12 AWG.

C) Ball Markers: Round, high-density watertight polyethylene shell, impervious to minerals, chemicals, and temperature extremes normally found in the underground environment. RFID marker shall be encased within shell in a biodegradable mixture of propylene glycol and water.

(1) Color: Green.

2.6 BEDDING AND COVER MATERIALS

A) Bedding and Cover: Granular material Class II as defined by Michigan Department of Transportation 2012 Standard Specifications for Construction Table 902-3.

B) Suitable on site material may be utilized as bedding and cover with approval of Engineer.

C) Soil Backfill from Above Pipe to Finish Grade: As specified in Section 31 23 17 - Trenching.

2.7 EQUIPMENT

A) Laser

(1) Self-leveling with digital grade input

(2) Accuracy: plus or minus 1/16 inch over 100 feet

(3) Target: manufactured for pipe installation, supplied with laser.

PART 3 EXECUTION

3.1 EXAMINATION

A) Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B) Verify trench bottom is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

C) Verify location of proposed manholes for proper sewer alignment.

D) Verify end location of proposed laterals to match existing sewer laterals or to provide alignment for future connections.

E) Verify location of proposed cleanouts. Whenever possible, cleanouts for new laterals on existing services shall be located directly in line with the existing lateral, without the use of bends upstream from the cleanout.

F) Verify alignment of lateral and location of proposed wye fitting.

G) Notify Engineer of conflicts with other utilities, surface improvements, and trees.

3.2 PREPARATION

A) Correct over excavation with bedding material.

B) Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.

C) Protect and support existing sewer lines, utilities and appurtenances.

D) Maintain profiles of utilities. Coordinate with other utilities to eliminate interference. Notify Engineer where crossing conflicts occur.

3.3 BEDDING

A) Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

B) Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

C) Provide sheeting and shoring in accordance with Section 31 23 17.

D) Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent maximum density per ASTM D1557.

E) Backfill around sides and to top of pipe with cover fill; tamp in place and compact to 95 percent maximum density per ASTM D1557.

F) Maintain optimum moisture content of fill material to attain required compaction density.

3.4 INSTALLATION - PIPE

A) Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

B) Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet; begin at downstream end and progress upstream. Do not allow tolerances to accumulate. Utilize laser to maintain line and grade.

C) Assemble and handle pipe in accordance with manufacturer's instructions.

D) Keep pipe and fittings clean until work is completed and accepted by Engineer. Cap open ends during periods of work stoppage.

E) Lay bell and spigot pipe with bells upstream.

F) Connect pipe to existing sewer system. Use only manufactured solid sleeve fittings. Do not use flexible couplings.

G) Install trace wire continuous over top of pipe buried 24 inches below finish grade, above pipe line; coordinate with Section 31 23 17. Continue trace wire up sides of manholes and terminate with 12 inch tail below manhole cover.

3.5 INSTALLATION - WYE BRANCHES

A) Install wye branches at locations indicated on Drawings concurrent with pipe laying operations. Use standard fittings of same material and joint type as sewer main.

B) Maintain minimum 5 feet separation distance between wye connection and manhole.

C) Adjust location of wye branches as necessary to match existing laterals. Do not install wye branch upstream of existing lateral being served.

3.6 INSTALLATION - SANITARY LATERALS

A) Construct laterals from wye branch to cleanout.

(1) Use only manufactured fittings to adjust for alignment of existing lateral.

(2) Do not use 90 degree bends.

B) Where depth of main pipeline warrants, construct mainline riser.

C) Install cleanout cover with riser cover for cleanouts located in driveways, asphalt or concrete areas.

D) Construct laterals from cleanout to terminal point.

(1) Do not install bends upstream from the cleanout without approval of Engineer.

(2) Use only manufactured fittings to adjust for alignment of existing lateral.

(3) Do not adjust for alignment at connection to existing piping.

E) Maintain 5 feet minimum depth of cover over pipe. Where cover is less than 5 feet, insulation shall be placed over the pipe.

F) Maintain minimum 5 feet separation distance between adjacent laterals and other parallel service lines.

G) Install laterals at a minimum slope of 1.0%.

H) Install watertight plug, braced to withstand pipeline test pressure thrust, at termination of laterals to empty lots.

I) Connect new lateral pipe to existing lateral pipe with flexible coupling matching diameter of both pipe sizes.

3.7 BACKFILLING

A) Measure and record the distance between all manholes, wyes, fittings, and cleanouts prior to backfill.

B) Backfill around sides and to top of pipe in accordance with Section 31 23 17.

C) Maintain optimum moisture content of bedding material to attain required compaction density.

3.8 FIELD QUALITY CONTROL

A) Section 01 40 00 - Quality Requirements.

B) Request inspection prior to placing bedding.

C) Owner's representative will perform laboratory testing of bedding material to determine gradation in accordance with ASTM C117 and ASTM C136.

D) Owner's representative will perform testing of bedding material to determine maximum density in accordance with ASTM D1557 or Michigan Cone Method.

E) Owner's representative will perform in place compaction tests of bedding and backfill material in accordance with the following:

(1) Density Tests: ASTM D2922.

(2) Moisture Tests: ASTM D3017.

F) Frequency of Tests: At each compacted bedding and backfill layer, one test for each 150 feet or less of trench length. Additional testing may be required at the discretion of the Engineer.

G) Low Pressure Air Test: Test in accordance with Section 33 01 32.

H) Deflection Test: Test in accordance with Section 33 01 32.

I) When tests indicate Work does not meet specified requirements, remove work, replace and retest.

3.9 PROTECTION OF FINISHED WORK

A) Section 01 70 00 - Execution and Closeout Requirements.

B) Protect pipe and aggregate cover from damage or displacement until backfilling operation is complete.

(1) Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.

(2) Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION

SECTION 33 36 00 SEPTIC SYSTEMS

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Site Clearing for Utilities Installations: Section 31 10 00 “Site Preparation”

B) Utility Trenching: Section 31 20 00 “Earth Moving”

C) Excavation, Backfill, and Compaction for Utilities: Section 31 20 00 “Earth Moving”

D) Sleeves for Utilities Running Under Pavements: Section 32 17 00 “Paving Specialties”

E) Storm Water Management: Section 33 40 00 “Storm Drainage Utilities”

1.2 SUBMITTALS

A) Submit Product Data prior to installation.

(1) Tanks and pump chambers

(2) Pumps

(3) Filters

(4) Monitoring system

B) Record Project Drawings to Owner after project completion.

C) Test results from any tests conducted to Owner after project completion.

D) Operation and maintenance plan to Owner after project completion.

1.3 QUALITY ASSURANCE

A) Install all underground utility lines as indicated on the drawings and as required for a complete utility service to the Project as designed.

(1) Comply also with the requirements of mechanical, electrical and plumbing Drawings and Specifications.

B) Coordinate utilities installations with the Owner and with the utility services providers applicable to the Project.

(1) Obtain all permits and approvals for site utilities installations.

(2) Initiate, arrange for, and schedule utilities installations well in advance of the time they are needed to avoid construction or Project completion delays due to lack of availability of utility services.

(3) Verify all utility locations with the Owner, the Engineer, and the applicable utility service providers, including tap locations, underground utility paths, meter locations, and service entry points at the building perimeter.

(4) Do not proceed with utility services installations prior to receiving approval from the Owner.

C) Pay all utility installation and connection costs required to provide services indicated, including all service fees and installation charges.

D) Document the location of all underground utility line locations.

(1) Identify the ends of underground sleeves on the Project Site with marker stakes.

(2) Record, label, and dimension all underground utility line locations on the Record Project Drawings.

E) Provide all utility work in conformance with the standards, specifications and details of the local Authorities Having Jurisdiction.

(1) Where specifications or details differ between these Contract Documents and the standards of applicable Authorities Having Jurisdiction, comply with the more stringent requirements.

F) Provide precast concrete manholes, septic tanks, and similar structures manufactured specifically for the subsurface use intended in the site conditions present, designed and manufactured by a company with at least 10 years successful experience in the design and manufacture of similar plant-cast reinforced concrete structures.

PART 2 PRODUCTS

2.1 MATERIALS

A) Sanitary Septic Pipe: Per Design Plans and as approved by the local Health Department for use in the septic system.

B) Septic Tanks: Per Design plans

C) Dosing Pumps: Per Design plans

D) Septic Stone: Per Design plans

2.2 ACCESSORY MATERIALS

A) Provide all accessory materials and appurtenances required for complete and proper utilities installations, including, but not limited to, connectors, valves, taps, meters, gaskets, and sealants.

PART 3 EXECUTION

3.1 PREPARATION

A) Notify “Miss Dig” at least 3 working days prior to subsurface excavation or construction.

(1) Telephone Number: (800-482-7171).

B) Do not interrupt utilities serving facilities occupied by Owner or others without at least 48 hours prior notice.

(1) Provide temporary utility services where needed utility services are interrupted for an extended length of time, as directed by the Owner.

C) Provide all site clearing required for utilities installations.

(1) Follow Specification Section 31 10 00 for clearing activities.

(2) Do not clear or damage trees and other existing landscape features without prior approval of the Owner.

3.2 SEPTIC SYSTEM

A) Provide a complete, functioning, private septic system on the property as indicated in the Drawings.

(1) Provide all piping, septic tanks, dosing equipment, pumps, drain fields, and accessory equipment required for proper operation of the system.

(2) Follow the procedures, requirements, design details, and specifications dictated by the Health Department having jurisdiction.

(3) Provide perk testing as required to obtain Health Department approval of the proposed system and drain field locations.

(4) Provide reserve drain fields of size equal to that required for the functioning drain fields, or as specifically directed by the Health Department.

(5) Provide clean-out access in the septic system piping just outside the building perimeter line.

(6) Avoid compaction of the base in the area of proposed drain field from machinery.

END OF SECTION

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- Get immediate notification from your smart device of alarm activation – anywhere in the world
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- Loss of WiFi notification (utilizes smart wireless monitoring to prevent nuisance notifications)

New! Super-bright LED alarm ring - Increases visibility

Snap-on Compact Float
Model ALM-P1-EYE
(Sump Pump Applications)

Wide Angle Float
Model ALM-2-EYE
(Recommended for Sewage Applications)

Normal Status Screen

Alarm Notification Screen

MODEL	Float Style	Float Cord Length	Weight lbs.
ALM-P1-EYE	Compact snap-on	10'	2
ALM-2-EYE	Wide-angle	20'	4
ALM-2-1-EYE	Wide-angle	10'	3

NOTE: During power outages, your home's wireless router will not be operational and unable to send signals to your mobile device unless on a backup power source. The alarm unit mounted in the basement will still activate running on 9-volt battery.

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SECTION 33 40 00 STORMWATER UTILITIES

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Utility Trenching: Section 31 20 00 “Earth Moving”

B) Sanitary Sewers: Section 33 31 00 “Sanitary Sewerage Utilities”

C) Water Mains: Section 33 10 00 “Water Utilities”

1.2 REFERENCES

A) ASTM (ASTM International)

(1) A48 “Standard Specification for Gray Iron Castings”

(2) A74 " Standard Specification for Cast Iron Soil Pipe and Fittings"

(3) C478 “Standard Specification for Precast Reinforced Concrete Manhole Sections”

(4) C913 “Standard Specification for Precast Concrete Water and Wastewater Structures”

(5) D1784 "Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds"

(6) D2321 “Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications”

(7) D2564 " Standard Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Piping Systems"

(8) D2665 "Standard Specification for Polyvinyl Chloride (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings"

(9) D2729 “Standard Specification for Polyvinyl Chloride (PVC) Sewer Pipe and Fittings”

(10) D2855 " Standard Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings"

(11) D3034 "Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings"

(12) D3212 “Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals”

(13) D3350 “Standard Specification for Polyethylene Plastics Pipe and Fittings Materials”

(14) D4491 “Standard Test Methods for Water Permeability of Geotextiles by Permittivity”

(15) F477 " Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe"

(16) F891 " Standard Specification for Coextruded Polyvinyl Chloride (PVC) Plastic Pipe With a Cellular Core"

B) State of Michigan

(1) Part 91 of Act 451 of the Public Acts of 1994 (Natural Resources and Environmental Protection Act), “Soil Erosion and Sedimentation Control Act” (SESCA)

C) NCMA (National Concrete Masonry Association)

(1) TEK 19-3A “Preventing Water Penetration in Below-Grade Concrete Masonry Walls”

1.3 SYSTEM DESCRIPTION

A) Provide subsurface drainage on the exterior side of footings and below the level of the lowest adjacent interior (basement) floor where drainage of groundwater and/or runoff is required, in accordance with the details shown in the Drawings and the recommendations of NCMA TEK 19-3A.

B) Size storm water detention basins to retain a volume as specified in the Design Plans.

1.4 SUBMITTALS

A) Submit Product Data.

(1) Drainage piping.

(2) Filter fabric.

1.5 QUALITY ASSURANCE

A) Comply with all applicable local, state, and federal codes, laws, ordinances, rules, and regulations.

(1) Pay all fees in connection with installation of storm drainage utilities.

B) Comply with the Michigan “Soil Erosion and Sedimentation Control Act” (SESCA).

C) Provide catch basins and similar structures manufactured specifically for the subsurface use intended in the site conditions present, designed and manufactured by a company with at least 10 years successful experience in the design and manufacture of similar structures.

PART 2 PRODUCTS

2.1 MATERIALS

A) Polyethylene Storm Sewer Pipe: Corrugated, high density polyethylene piping designed for non-pressure drainage applications and meeting ASTM D3350.

(1) Diameter as indicated in the Drawings.

(2) Minimum Cell Classification for 4 inch to 10 inch Diameter Pipes: 32442-C.

(3) Minimum Cell Classification for 12 inch to 30 inch Diameter Pipes: 335420-C.

(4) Provide all joints and fittings as recommended by the pipe manufacturer for a complete installation.

(5) Approved Product: Hancor, Inc., Hi-Q.

B) PVC Storm Sewer Pipe and Fittings, NPS 15(DN 375) and Smaller: ASTM D3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F477 elastomeric seals.

C) PVC Storm Sewer Pipe and Fittings, NPS 8(DN 200) and Smaller: ASTM D2665, solid wall DWV with solvent sealed joints using ASTM D2564 solvent cement.

D) PVC Storm Sewer Pipe and Fittings, NPS 8(DN 200) and Smaller: ASTM F891, Schedule 40, solid wall with solvent sealed joints using ASTM D2855 solvent cement.

E) Pipe Joints: ASTM D3212.

F) Nonpressure-Type Pipe Couplings: Unshielded flexible elastomeric sleeve with corrosion-resistant metal tension band and tightening mechanism on each end.

G) Cleanouts: Cast iron cleanout with threaded adjustable housing, flanged ferrule, brass cleanout plug, and round cast iron heavy duty secured scoriated cover.

(1) Provide Wade Model 6000Z-75-179 or equivalent.

(2) Provide sewer pipe fittings and risers to cleanouts complying with ASTM A74, service class, cast iron soil pipe and fittings.

H) Catch Basins: Precast reinforced concrete catch basins per ASTM C478.

(1) Provide vertical brick stacks, mortar, grout, sealant joints, and all other accessories required for a complete installation.

(2) Diameter: See plan

I) Yard drains: Precast reinforced concrete Sections per ASTM C478, with precast, reinforced, perforated concrete rings per ASTM C913, of depth required.

(1) Precast reinforced concrete meeting HS-20 loading requirements.

(2) Individual fiber reinforced plastic (FRP) steps wide enough to allow a worker to place both feet on one step at 12 to 16 inch vertical spacing.

(3) Reinforced concrete grade rings, 6 to 9 inch total thickness, to match diameter of manhole frame and cover and finished grade required.

J) Manhole Covers: Cast iron manhole covers consisting of coordinated frame and cover, per ASTM A48.

(1) Class: 30.

(2) Opening Diameter: 24 inches.

(3) Approved Manhole Frames: East Jordan, See plans.

(4) Approved Manhole Covers: East Jordan Iron Works, Type M.

K) Pipe Outlet Headwalls: Cast-in-place reinforced concrete, with apron and tapered sides.

L) Footing and Foundation Drainage Piping: Perforated PVC sewer pipe and fittings per ASTM D2729.

(1) Diameter: 4 inches unless noted otherwise

(2) Bell-and-spigot ends, for loose joints.

M) Filter Fabric: Geotextile filter fabric of woven or non-woven polypropylene or polyester fibers, or combination of both.

(1) Flow Rate: 110 to 330 gallons per minute per square foot, per ASTM D4491.

(2) Style: Flat sheet.

(3) Provide all stakes and anchorage accessories required for a complete installation.

(4) Approved Product: Amoco CEF 4553.

N) Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed coarse gravel, ASTM D448, coarse aggregate.

(1) Aggregate Size: No.57, with 100 percent passing a 1-1/2-inch sieve and not more than 5 percent passing a No.8 sieve.

PART 3 EXECUTION

3.1 PREPARATION

A) Provide excavation, bedding and backfill in accordance with Section 31 20 00 “Earth Moving.”

B) Notify the Engineer of discrepancies discovered between the design indicated and actual conditions on the Site.

(1) Obtain approval of modified design before proceeding with Work.

3.2 STORM SEWERAGE INSTALLATION

A) Comply with the pipe manufacturer’s installation instructions and ASTM D2321.

(1) Conform to lines, grades, and tolerances required.

(2) Minimum Cover in Trafficked Areas: 12 inches.

END OF SECTION

SECTION 33 50 00 FUEL DISTRIBUTION UTILITIES

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Site Clearing for Utilities Installations: Section 31 10 00 “Site Preparation”

B) Utility Trenching: Section 31 20 00 “Earth Moving”

C) Excavation, Backfill, and Compaction for Utilities: Section 31 20 00 “Earth Moving”

D) Sleeves for Utilities Running Under Pavements: Section 32 17 00 “Paving Specialties”

1.2 ALLOWANCES

A) Provide natural gas connection fees as an allowance per Section 01 21 00 “Allowances.”

(1) All other costs for natural gas service installation are to be included in the Contract Sum, outside of the allowance.

1.3 SUBMITTALS

A)

1.4 QUALITY ASSURANCE

A) Install all underground utility lines as indicated on the drawings and as required for a complete utility service to the Project as designed.

(1) Comply also with the requirements of mechanical, electrical and plumbing Drawings and Specifications.

B) Coordinate utilities installations with the Owner and with the utility services providers applicable to the Project.

(1) Obtain all permits and approvals for site utilities installations.

(2) Initiate, arrange for, and schedule utilities installations well in advance of the time they are needed to avoid construction or Project completion delays due to lack of availability of utility services.

(3) Verify all utility locations with the Owner, the Architect, and the applicable utility service providers, including tap locations, underground utility paths, meter locations, and service entry points at the building perimeter.

(4) Do not proceed with utility services installations prior to receiving approval from the Owner.

(5) Facilitate transfer of utility services accounts to the Owner’s name at the earliest time after services are installed.

C) Pay all utility installation and connection costs required to provide services indicated, including all service fees and installation charges.

D) Document the location of all underground utility line locations.

(1) Identify the ends of underground sleeves on the Project Site with marker stakes.

(2) Record, label, and dimension all underground utility line locations on the Record Project Drawings.

E) Provide all utility work in conformance with the standards, specifications and details of the local Authorities Having Jurisdiction.

(1) Where specifications or details differ between these Contract Documents and the standards of applicable Authorities Having Jurisdiction, comply with the more stringent requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A) Gas Piping: As recommended by the natural gas service provider.

(1) Diameter as indicated in the Drawings.

B) Propane Storage Tanks (Pigs): As recommended by and provided by the propane gas service provider.

C) Gas Valves: As recommended by the natural gas service provider.

D) Gas Meters: As recommended by the natural gas service provider.

2.2 ACCESSORY MATERIALS

A) Provide all accessory materials and appurtenances required for complete and proper utilities installations, including, but not limited to, connectors, valves, taps, meters, gaskets, and sealants.

PART 3 EXECUTION

3.1 PREPARATION

A) Notify “Miss Dig” at least 3 working days prior to subsurface excavation or construction.

(1) Telephone Number: (800-482-7171).

B) Do not interrupt utilities serving facilities occupied by Owner or others without at least 48 hours prior notice.

(1) Provide temporary utility services where needed utility services are interrupted for an extended length of time, as directed by the Owner.

C) Provide all site clearing required for utilities installations.

(1) Follow Specification Section 31 10 00 for clearing activities.

(2) Do not clear or damage trees and other existing landscape features without prior approval of the Owner.

3.2 NATURAL GAS SERVICE

A) Provide functioning, underground natural gas service to the building.

(1) Provide all required piping, meter bases. Meters, and manifolds for gas service at the building exterior wall line.

(2) Locate natural gas meter in conformance with the natural gas service provider’s requirements for separation from adjacent windows, doors, building ventilation louvers, and other utilities.

(3) Coordinate installation of natural gas service with the natural gas service provider and the Authorities Having Jurisdiction.

3.3 PROPANE GAS SERVICE

A) Provide functioning propane gas service to the building.

(1) Provide propane gas storage tanks (pigs) as indicated in the Drawings and as required to adequately service the building’s fuel needs and as acceptable to the natural gas fuel provider.

(2) Provide a minimum 4 inch thick concrete housekeeping pad under propane gas storage tanks.

(3) Provide underground propane gas piping from the propane storage tanks to the building propane service entrance point.

(4) Coordinate installation of propane gas service with the propane gas provider and the Authorities Having Jurisdiction.

END OF SECTION

SECTION 33 70 00 ELECTRICAL UTILITIES

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Site Clearing for Utilities Installations: Section 31 10 00 “Site Preparation”

B) Utility Trenching: Section 31 20 00 “Earth Moving”

C) Excavation, Backfill, and Compaction for Utilities: Section 31 20 00 “Earth Moving”

D) Sleeves for Utilities Running Under Pavements: Section 32 17 00 “Paving Specialties”

1.2 ALLOWANCES

A) Owner will be responsible for the costs and coordination for the Electrical Service installation up to and including the Electric Meter.

(1) All other costs for electrical service installation are to be included in the Contract Sum.

1.3 SUBMITTALS

A) Design drawing showing all proposed utility lines, connections, transformers and meters on building for Owner approval prior to installation.

B) Record Drawings at project completion.

1.4 QUALITY ASSURANCE

A) Install all underground utility lines as indicated on the drawings and as required for a complete utility service to the Project as designed.

(1) Comply also with the requirements of mechanical, electrical and plumbing Drawings and Specifications.

B) Coordinate utilities installations with the Owner and with the utility services providers applicable to the Project.

(1) Obtain all permits and approvals for site utilities installations.

(2) Initiate, arrange for, and schedule utilities installations well in advance of the time they are needed to avoid construction or Project completion delays due to lack of availability of utility services.

(3) Verify all utility locations with the Owner, the Architect, and the applicable utility service providers, including tap locations, underground utility paths, meter locations, and service entry points at the building perimeter.

(4) Do not proceed with utility services installations prior to receiving approval from the Owner.

(5) Facilitate transfer of utility services accounts to the Owner’s name at the earliest time after services are installed.

C) Document the location of all underground utility line locations.

(1) Identify the ends of underground sleeves on the Project Site with marker stakes.

(2) Record, label, and dimension all underground utility line locations on the Record Project Drawings.

D) Provide all Utility Work in conformance with the standards, specifications and details of the local Authorities Having Jurisdiction.

(1) Where specifications or details differ between these Contract Documents and the standards of applicable Authorities Having Jurisdiction, comply with the more stringent requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A) Electric Service Main Disconnect Switches: As required by the electric power service provider and the Authorities Having Jurisdiction.

2.2 ACCESSORY MATERIALS

A) Provide all accessory materials and appurtenances required for complete and proper utilities installations, including, but not limited to, connectors, insulators, taps, meters, gaskets, guys, anchors, and sealants.

PART 3 EXECUTION

3.1 PREPARATION

A) Notify “Miss Dig” at least 3 working days prior to subsurface excavation or construction.

(1) Telephone Number: (800-482-7171).

B) Do not interrupt utilities serving facilities occupied by Owner or others without at least 48 hours prior notice.

(1) Provide temporary utility services where needed utility services are interrupted for an extended length of time (minimum 4 hours during business hours, 24 hours otherwise), as directed by the Owner.

C) Provide all site clearing required for utilities installations.

(1) Follow Specification Section 31 10 00 for clearing activities.

(2) Do not clear or damage trees and other existing landscape features without prior approval of the Owner.

3.2 ELECTRIC POWER SERVICE

A) Provide functioning, underground electric power service to the building.

B) Provide transformers (either owned by the electric utility service provider or by the Owner) as required by the electric service provider.

C) Provide service in continuous underground sleeves from the electric service provider’s pedestal/utility pole/transformer (existing service location) to the building electrical service entrance point, following a route approved by the Owner and the electric utility.

(1) Minimum Sleeve Inside Diameter: 4 inches.

(2) Minimum Sleeve Burial Depth: 24 inches.

(3) Use sweeps for all bends, LB’s or plumbing 90’s are not acceptable.

(4) If required by the electric utility, provide a pull box of diameter determined by the electric utility.

(5) Provide a pull tape in all sleeves.

D) Provide meter base, meter, service entrance/termination equipment required for electric power service to the building.

(1) Coordinate location and installation of termination equipment with the electric utility and the Authorities Having Jurisdiction.

END OF SECTION

SECTION 33 80 00 COMMUNICATIONS UTILITIES

PART 1 GENERAL

1.1 RELATED SECTIONS

A) Site Clearing for Utilities Installations: Section 31 10 00 “Site Preparation”

B) Utility Trenching: Section 31 20 00 “Earth Moving”

C) Excavation, Backfill, and Compaction for Utilities: Section 31 20 00 “Earth Moving”

D) Sleeves for Utilities Running Under Pavements: Section 32 17 00 “Paving Specialties”

1.2 SUBMITTALS

A) Submit all data necessary for a complete installation.

1.3 QUALITY ASSURANCE

A) Install all underground utility lines as indicated on the drawings and as required for a complete utility service to the Project as designed.

(1) Comply also with the requirements of mechanical, electrical and plumbing Drawings and Specifications.

B) Coordinate utilities installations with the Owner and with the utility services providers applicable to the Project.

(1) Obtain all permits and approvals for site utilities installations.

(2) Initiate, arrange for, and schedule utilities installations well in advance of the time they are needed to avoid construction or Project completion delays due to lack of availability of utility services.

(3) Verify all utility locations with the Owner, the Architect, and the applicable utility service providers, including tap locations, underground utility paths, meter locations, and service entry points at the building perimeter.

(4) Do not proceed with utility services installations prior to receiving approval from the Owner.

(5) Facilitate transfer of utility services accounts to the Owner’s name at the earliest time after services are installed.

C) Document the location of all underground utility line locations.

(1) Identify the ends of underground sleeves on the Project Site with marker stakes.

(2) Record, label, and dimension all underground utility line locations on the Record Project Drawings.

D) Provide all utility work in conformance with the standards, specifications and details of the local Authorities Having Jurisdiction.

(1) Where specifications or details differ between these Contract Documents and the standards of applicable Authorities Having Jurisdiction, comply with the more stringent requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A) Telephone Service Cable: As recommended by and provided by the telephone service provider.

B) Utility Poles: Preservative-treated solid wood poles.

(1) Diameter and Height: As approved by the applicable utility company for the pole spacing and the application intended.

C) Data Service Cable: As recommended by and provided by the data service provider.

2.2 ACCESSORY MATERIALS

A) Provide all accessory materials and appurtenances required for complete and proper utilities installations, including, but not limited to, connectors, insulators, taps, masts, guys, anchors, meters, gaskets, and sealants.

PART 3 EXECUTION

3.1 PREPARATION

A) Notify “Miss Dig” at least 3 working days prior to subsurface excavation or construction.

(1) Telephone Number: (800-482-7171).

B) Do not interrupt utilities serving facilities occupied by Owner or others without at least 48 hours prior notice.

(1) Provide temporary utility services where needed utility services are interrupted for an extended length of time, as directed by the Owner.

C) Provide all site clearing required for utilities installations.

(1) Follow Specification Section 31 10 00 for clearing activities.

(2) Do not clear or damage trees and other existing landscape features without prior approval of the Owner.

3.2 TELEPHONE SERVICE

A) Owner will be responsible for the costs and coordination for the Telephone Service installation up to and including the Service Point on the building.

(1) Minimum Sleeve Inside Diameter: 4 inches.

(2) Minimum Sleeve Burial Depth: 24 inches.

(3) Use sweeps for all bends, LB’s or plumbing 90’s are not acceptable.

(4) If required by the telephone service provider, provide a pull box of diameter determined by the telephone service provider.

(5) Provide a pull tape in all sleeves.

B) Where continuous sleeved underground burial of telephone cable is not possible, provide direct, trench burial of cable.

(1) Minimum Trench Depth: 36 inches.

(2) Minimum Trench Width: 12 inches.

C) Do not combine telephone cable with electric power service wiring in the same sleeve or trench.

D) Provide sleeved routes from the building exterior to the telephone equipment panel inside the building.

(1) Coordinate location and installation of termination equipment with the telephone service provider and the Authorities Having Jurisdiction.

E) Provide a minimum 4 feet wide by 4 feet tall, 3/4 inch thick plywood backboard for mounting of telephone service termination equipment.

(1) Provide a minimum #6 ground wire from the telephone service termination point to the building’s ground bus or power service ground rod.

(2) If the backboard cannot be placed adjacent to the electrical service panel, provide a 3/4 inch thin wall conduit along with the #6 ground wire from the backboard to the ground source.

3.3 DATA CABLE SERVICE

A) Owner will be responsible for the costs and coordination for the Data Cable Service installation up to and including the Service Point on the building.

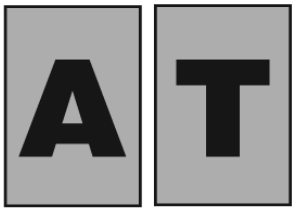
(1) Provide minimum 4 inch diameter underground sleeves from the data cable service provider's pedestal/utility pole to the building data service entrance point.

(2) Minimum Sleeve Burial Depth: 24 inches.

(3) Do not combine data cable with electric power service wiring in the same sleeve.

(4) Coordinate location and installation of termination equipment with the data cable service provider and the Authorities Having Jurisdiction.

END OF SECTION



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