
PROJECT MANUAL

COBB COUNTY PARKS NEW MAINTENANCE BUILDING



**OWNER: COBB COUNTY GEORGIA
C/O COBB COUNTY PARKS DEPARTMENT**

1792 County Services Parkway
Marietta, Ga. 30008

Sealed Bid #24-6827

April 12, 2024



COBB COUNTY PROCUREMENT SERVICES DEPARTMENT

122 Waddell Street NE
Marietta, Georgia 30060
(770) 528-8400 /Fax: (770) 528-8428
Email: procurement-services@cobbcounty.org
<https://www.cobbcounty.org/procurement-services>

IMPORTANT NOTICE – PLEASE READ CAREFULLY!!

ALL bids **MUST** be received at the Cobb County Procurement Services Department.

**BIDS MUST BE RECEIVED BEFORE 12:00 (NOON) ON BID
OPENING DAY**

Any bid received later than 12:00 (Noon) will not be accepted. The County accepts no responsibility for delays in the mail. Bids are to be mailed or delivered to:

**COBB COUNTY PROCUREMENT SERVICES DEPARTMENT
122 WADDELL STREET NE
MARIETTA, GA 30060**

All bids shall be submitted on the Bid Proposal Form. Any revisions made on the outside of the envelope **WILL NOT** be considered.

PLEASE CHECK bid specifications and advertisement for document requirements.

Documents/Forms listed below **MUST** be submitted when required. Omission of these documents /forms will cause your bid/proposal to be declared **NON-RESPONSIVE**.

BID SUBMITTAL FORM (Required)

- ▶ *Official Signature is required on this form guaranteeing the quotation.*

CONTRACTOR AFFIDAVIT and AGREEMENT – Exhibit A (Required)

- ▶ *Affidavit **MUST** be signed, notarized and submitted with any bid requiring the performance of physical services. If the affidavit is not submitted at the time of the bid, bid will be determined non-responsive and will be disqualified.*

BID BOND (Required)

A “**SEALED BID LABEL**” has been enclosed to affix to your bid. This label **MUST** be affixed to the outside of the envelope or package, **even if it is a “NO BID” response**. Failure to attach the label may result in your bid being opened in error or not routed to the proper location for consideration. No bid will be accepted after the date and time specified.

Thank you in advance for your cooperation.

Advertisement for Bids

Sealed bids will be received **before 12:00 PM (Noon), on May 9, 2024** in the
Cobb County Procurement Services Department
122 Waddell Street, NE
Marietta, Georgia 30060

For furnishing all labor, materials, equipment, appliances, etc. pursuant to the plans, specifications, conditions, and addenda. The scope of work includes but is not limited to a 6,000 SF pre-engineered maintenance building including foundation, slab and interior work; grading; erosion control; septic system; landscaping; exterior concrete pavement and pads; and water connection. The building will be located at 1792 County Services Parkway, Marietta, GA 30008 behind the existing Equipment Shop.

NO BIDS WILL BE ACCEPTED AFTER THE 12:00 PM (NOON) DEADLINE

Sealed Bid # 24-6827
Cobb County PARKS New Maintenance Building
Cobb County PARKS Department

Pre-Bid Meeting: Wednesday, April 24 2024 @ 1:00 PM
Cobb County PARKS Administration Building
1792 County Services Parkway
Marietta, GA 30008

Bids are opened at 2:00 PM at the Cobb County Procurement Services Department, 122 Waddell Street NE, Marietta, Georgia 30060.

All contractors wishing to submit bids for this work must submit a qualification statement form (in bid package) to be considered. Proposals must be accompanied by bid security in the amount not less than five percent (5%) of the base bid. Performance Bond and Labor and Material Payment Bond, or other security instruments as allowed by law each in the amount equal to 100% of the contract sum will be required of the successful bidder. Bonds must be written by a surety company licensed to do business in the State of Georgia, have a "Best's" rating of "A" or better, appear on the current U.S. Treasury Department list of sureties that are acceptable on bonds for the federal government (Circular 570), and have a recommended bonds limits equal to or in excess of those required for this project; otherwise acceptable to the owner.

The Georgia Security and Immigration Compliance Act Affidavit form must be submitted with all bid packages involving the "performance of physical services" in order to be considered.

No bid may be withdrawn for a period of sixty (60) days after date of bid opening, unless otherwise specified in the bid documents. Cobb County will consider the competency and responsibility of bidders in making the award. Cobb County reserves the right to reject any and all bids, to waive informalities and technicalities, to reject portions of the bids, and to award contracts in a manner consistent with the County and the laws governing the State of Georgia.

This solicitation and any addenda are available on the Cobb County Procurement Services website:
<https://www.cobbcounty.org/procurement-services>.



BID SUBMITTAL FORM

SUBMIT BID/PROPOSAL TO:

Cobb County Procurement Services Department
122 Waddell Street NE
Marietta, GA 30060

SEALED BID # 24-6827

Invitation to Bid

Cobb County PARKS New Maintenance Building
Cobb County PARKS Department

DELIVERY DEADLINE: May 9, 2024 BEFORE 12:00 PM (NOON) EST
(NO BIDS WILL BE ACCEPTED AFTER THIS DEADLINE).

Bid Opening Date: **May 9, 2024 @ 2:00 PM** in the Cobb County Procurement Services Department, 122 Waddell Street NE, Marietta, Georgia, 30060.

BUSINESS NAME AND ADDRESS INFORMATION:

COMPANY NAME: _____

CONTACT NAME: _____

COMPANY ADDRESS: _____

E-MAIL ADDRESS: _____

PHONE NUMBER: _____

FAX NUMBER: _____

NAME AND OFFICIAL TITLE OF OFFICER GUARANTEEING THIS QUOTATION:

PRINT/TYPE NAME

TITLE

TELEPHONE: _____

FAX: _____

BIDDER WILL INDICATE TIME PAYMENT DISCOUNT: _____

BIDDER SHALL INDICATE MAXIMUM DELIVERY DATE (UNLESS OTHERWISE SPECIFIED IN BID SPECIFICATIONS)

SIGNATURE OF OFFICER ABOVE:

(SIGNATURE)

Bids received after the date and time indicated will not be considered. Cobb County reserves the right to reject any and all bids, to waive informalities, to reject portions of the bid, to waive technicalities and to award contracts in a manner consistent with the county and the laws governing the State of Georgia.

The enclosed (or attached) bid is in response to Bid Number **24-6827** is a firm offer, **as defined by section O.C.G.A. (s) 11-2-205 of the code of Georgia (Georgia laws 1962 pages 156-178)**, by the undersigned bidder. This offer shall remain open for acceptance for a period of 60 calendar days from the bid opening date, as set forth in this invitation to bid unless otherwise specified in the bid documents.

NOTICE TO BIDDERS - - BID QUOTES MUST INCLUDE DELIVERY CHARGES

SEALED BID LABEL

SEALED BID ENCLOSED

DELIVER TO:

**Cobb County Procurement Services
122 Waddell Street NE
Marietta, GA 30060**

SEALED BID # 24-6827 DATE: May 9, 2024

BIDS MUST BE RECEIVED BEFORE 12:00 PM (NOON)

DESCRIPTION: Cobb County PARKS New Maintenance Building

VENDOR: _____

LABEL *MUST* BE ATTACHED TO OUTSIDE OF BID PACKAGE



"STATEMENT OF NO BID"

COBB COUNTY PROCUREMENT SERVICES DEPARTMENT
122 WADDELL STREET NE
MARIETTA, GA 30060

TO ALL PROSPECTIVE VENDORS:

Because of the many requests to be placed on our vendors' list, we are continuously updating the list. While we want to include all bona fide vendors, we do not want to mail bids/proposals to those vendors who may no longer be interested in participating in our Invitation to Bid (ITB) process.

If you do not choose to respond to the attached ITB, please fill out the form below indicating if you want to be retained on our current vendor list.

Vendors who do not respond in any way (by either submitting a bid or by returning this form) over a period of one year may be removed from the current vendor list.

Vendors who do not wish to submit a bid will often return the entire solicitation packet. This is not necessary, and you can return this completed form to procurementservices@cobbcounty.org.

Thank you for your cooperation.
Cobb County Procurement Services Department

"STATEMENT OF NO BID"

Sealed Bid Number 24-6827

Invitation to Bid

Cobb County PARKS New Maintenance Building

Cobb County PARKS Department

If you do not wish to respond to the attached Invitation to Bid, **please complete this form and send to procurementservices@cobbcounty.org or by Fax to 770-528-8428.**

I do not wish to submit a bid on this solicitation.

I wish to be retained on the vendor list for this commodity and/or service: Yes _____ No _____

Please PRINT the following:

Company

Representative

You are invited to list reasons for your decision not to submit a bid: _____



Cobb County...Expect the Best!

INVITATION TO BID

**Sealed Bid # 24-6827
Cobb County PARKS New Maintenance Building
Cobb County PARKS Department**

Bid Opening Date: May 9, 2024

Pre-Bid Conference: Wednesday April 24, 2024 @ 1:00 PM (E.S.T.)

**Bids Are Received in the Cobb County Procurement Services Department
122 Waddell Street NE
Marietta, GA 30060**

Before 12:00 (Noon) By the Bid Opening Date

**Bids will be opened in the Cobb County Procurement Services Department at 2:00 PM
122 Waddell Street NE
Marietta, GA 30060**

**VENDORS ARE REQUIRED TO SUBMIT THE ORIGINAL, ONE COPY AND ONE IDENTICAL
ELECTRONIC COPY ON FLASH DRIVE OF BID**

(UNLESS OTHERWISE SPECIFIED IN BID SPECIFICATIONS)

NAME: _____

ADDRESS: _____

REPRESENTATIVE: _____

PHONE: _____ FAX: _____

E-MAIL _____

NOTE: The Cobb County Procurement Services Department will not be responsible for the accuracy or completeness of the content of any Cobb County Invitation to Bid or Request for Proposals or subsequent addenda thereto received from a source other than the Cobb County Procurement Services Department.

SPECIAL TERMS AND CONDITIONS

In the event there are any discrepancies between the following provisions and other provisions in the bid and contract documents, the following provisions shall prevail:

1. CLARIFICATIONS AND CHANGES

- a. See Appendix B for construction access path.
- b. Sheet A2.1, Main Floor and Life Safety Plans – The planer, table saw, mitre saw, and dust collectors are not in contract (NIC) and will be provided by the Owner.
- c. Sheet C-2.0, Demolition Plan:
 - 1) Item 1 – “Remove and relocate existing pole barn as required to make way for new construction.” Pole barn will be removed and disposed of by Owner prior to the start of construction.
 - 2) Item 2 - “Remove and dispose of existing wood fence.” Fence will be removed and disposed of by Owner prior to start of construction.
 - 3) Item 4 – “Remove existing Leyland Cypress along edge of parking.” Leyland Cypress will be removed by Owner prior to start of construction.
- d. Sheet C-3.0, Site Plan: See Appendix D for dimensions on the gravel extents.
- e. Sheet C-4.0, Grading Plan: Owner will furnish and install the specified nine (9) new Leyland Cypress trees.
- f. Sheet C-5.0, Utility Plan: See Appendix C for locations of existing domestic water line tie-in and transformer. See Appendix E for more additional information regarding the new water line.
- g. Sheet E-3.1, Electrical Floor Plan Power:
 - 1) Note 2, “Telephone backboard . . . “ Delete from scope. No land lines to building.
 - 2) Note 3, “(2) 3” PVC conduits to property line for telephone service. Coordinate all details with telephone company prior to rough-in.” Remove from scope. No land lines to building.
 - 3) Power for Owner-supplied equipment will be by Owner (see a. above).
- h. Sheet P2.0, Detail 5 – Water service entrance detail calls for 1 ½” DIP. Entrance pipe shall be copper.

2. PERMIT FEES

The contractor shall pay all permitting fees associated with the work. The Base Bid shall include an allowance of \$4,000.00 for paying permit fees. The Contractor shall provide documentation of the permit fees to be reimbursed against the allowance. The allowance shall cover only the cost of the permit fees, i.e., the amount paid to the permitting authority. It does not cover labor, transportation or any other incidental costs associated with pulling the permit. Should the actual permit costs exceed \$4,000.00, the Contractor will be reimbursed for the additional costs. Should the actual costs be less than \$4,000.00, the difference will be returned to the Owner via a deductive change order.

Any other permit and licensing fees shall be the responsibility of the Contractor. The permit allowance amount shall be included in the schedule of values.

3. EROSION, SEDIMENTATION AND POLLUTION CONTROL MAINTENANCE

The Contractor is solely responsible for installing and maintaining erosion, sedimentation and pollution controls for the project. No payment will be made for any portion of the project for which temporary erosion, sedimentation and pollution controls are not properly installed and maintained. Any fines or delays for non-compliance of erosion control measures levied by any agency shall be the responsibility of the Contractor.

4. CONTRACT DRAWINGS

Contractor will receive a .pdf copy of the plans and specifications from the Owner. The Contractor shall be responsible for ensuring the drawings are printed to scale. Additional sets of printed drawings and specifications for Contractor's use during construction may be purchased from consultant at no cost to Owner.

5. APPROVED VENDORS

All references to vendors and "approved manufacturers" are included for description of quality and content of the designated equipment/materials as basis of design. Alternate items may be accepted if they meet all standards of quality and purpose for the intended use, as determined by the Owner unless specifically noted otherwise.

Substitution or equal product requests will not be considered during the bidding period. However, it is the intention to allow equal products to be bid and incorporated into the project provided they meet all standards of quality and purpose of the intended use. Substitutions or equal products will be considered after award during the submittals process.

There shall be no substitutions for locksets. Refer to the paragraph labeled LOCKSETS below for additional information.

6. TIME OF WORK

It is understood that the Contractor's proposed construction schedule is based on a normal 40 hour, 5-day workweek, less recognized holidays. If the Contractor desires to work in excess of this limit, the Contractor shall submit a written request to the County a minimum of five days prior to the desired work date. The Contractor shall be responsible for any additional expenses incurred by the County as a result of the extended work hours, including resident inspection or materials testing overtime. The cost associated with resident inspector overtime will be deducted from the Contractor's monthly payment request.

By County ordinance, the erection or repair of buildings (including excavation), demolition, alteration, or repair of any building, as well as the operation of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist, electric saws, drills, or other equipment attended by loud or unusual noise are prohibited, other than between the hours of 7:00 AM and 9:00 PM, Monday through Saturday.

7. SUPERVISION

There shall be at least one designated employee in a position of responsibility representing the Contractor on each site at all times. Responsibilities of the designated employee include, but are not limited to planning, supervising, coordinating and inspecting all work by the labor force; acting as the primary liaison with the Owner; discussing the work with the Owner and regulating authorities; and translating from English to the language used by the workforce. Refer to Article 3 of Chapters 2 and 3 of the Contract for Construction for additional information.

8. INCLEMENT WEATHER DAYS

The following inclement weather calendar days shall be anticipated and included in the contractual time period given for project completion.

January	10 days	July	4 days
February	10 days	August	2 days
March	7 days	September	2 days
April	6 days	October	3 days
May	4 days	November	5 days
June	3 days	December	9 days

The Contractor's request for additional time due to weather shall only be granted for days beyond those listed above - considering the full term of the contract. The burden of proof and documentation for such request for additional time shall rest solely upon the Contractor. Documentation shall be submitted on a daily basis. Failure to submit documentation on a daily basis may result in requests for weather day extensions to be rejected.

Data submitted in support of a request for contract extension due to inclement weather shall include, but not be limited to: impact on the critical path of the project; daily high and low temperatures at the jobsite; daily rainfall amount at the jobsite; time that rainfall started and stopped; documented snow or ice accumulation; specific work impacted by inclement weather and date stamped photos of the impacted work or work area. A rain gauge and thermometer shall be placed at the jobsite to accurately record the data.

Weather days will not be approved unless impact to the critical path is properly documented as described above.

9. GENERAL CONTRACTOR LICENSE

All Bidders must be licensed by the state of Georgia as a General Contractor.

10. CONTRACTOR EXPERIENCE

Bidder shall have completed construction of a minimum of three (3) projects of similar size and complexity within the past five (5) years and submit current reference contacts on the enclosed form with the bid. The Contractor will identify on the Reference Form, by name, the

Superintendent for each project. The Superintendent assigned to this project must be approved by the County.

The purpose of requiring the submittal of previous experience is to ensure that the contract is awarded to a firm capable of properly executing the work involving similar facilities. If the bidder feels that the bidder's experience on other types of projects demonstrates that the bidder or a combination of bidder with the proposed subcontractors demonstrates similar experience, additional information explaining the qualifications may be submitted.

11. GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT

Based upon the County's experience and desire for full compliance, no work may be commenced by any subsequent subcontractor prior to notice being received by the County that all subcontractors (regardless of tier) are in compliance with the Georgia Security and Immigration Compliance Act and the attached Procedures & Requirements (refer to the **Cobb County General Instructions for Bidders, Terms and Conditions**), including the preparation and submission of the Contractor (or Subcontractor regardless of tier) Affidavit & Agreement AND the Immigration Compliance Certificate PRIOR to the commencement of any work.

Upon contracting with a new subcontractor, a contractor or subcontractor shall, as a condition of the contract or subcontract, provide Cobb County with notice of the identity of any and all subsequent subcontractors hired or contracted by that contractor or subcontractor within five (5) business days of entering into a contract or agreement for hire with any subcontractor. Such notice shall include an affidavit including the subcontractor's name, address, user ID number, and date of authorization to use the federal work authorization program. O.C.G.A. § 13-10-91 (b) (3).

Refer to **Cobb County General Instructions for Bidders, Terms and Conditions** within these Bidding Documents for additional information and complete instructions including required Affidavits.

12. COORDINATION OF SUBCONTRACTORS AND DOCUMENTS

The General Contractor is responsible for becoming familiar with the requirements of all construction documents, which includes drawings, bid and contract documents, specifications, and all addenda.

Letter prefixes for each drawing sheet indicating the engineering discipline are for convenience only. Information affecting the scope of work for all trades will be found throughout all documents and is not limited to only those documents with the appropriate letter prefix. The General Contractor is responsible for providing subcontractors all necessary information and drawings.

The drawings and specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. In a discrepancy exists between the drawings and

specifications, the discrepancy with the higher cost shall govern. The Owner shall be notified of the discrepancy.

13. PAYMENT FOR GRASSING

Seeded and sodded lawns will be acceptable provided the conditions of the construction documents have been met, including maintenance, and a healthy, uniform, close stand of grass is established, free of: bare spots in excess of 6 inches square and surface irregularities.

Unless specifically noted otherwise, all permanent seeding shall be Bermuda. Payment for seeding, if applicable, will be paid at 50% of the total contract amount for seeding until germination and grow-in of permanent grassing has achieved 95% on all areas to be seeded. Payment will be increased to 90% after 95% grow-in has been achieved. Final payment, and payment of retainage, will be made only after 100% grow-in has been achieved. Permanent seeding may only take place seasonally as listed in the Manual for Erosion and Sediment control in Georgia tables for permanent seeding region M-L. If the permanent Bermuda grass seeding cannot be installed during the specified dates, the contractor, at no additional expense to the owner, shall install temporary seeding and maintain temporary cover until the next season for permanent seeding. Temporary seeding in high pedestrian traffic areas will not be permitted for facilities that are to open before the next growing season. These areas must be sodded at no additional cost to the owner.

Final payment and release of retainage will not be made until establishment of permanent grass over 100% of the project is acceptable to the Designer and the County.

14. COORDINATION WITH UTILITIES

Contractor is responsible for: arranging for the power service and/or transformer placement with the applicable power provider in locations where transformer(s) are shown on the drawings; staking the transformer location; obtaining approval of the location from the County and power provider; and for payment for power service until the building(s) or facility served by the power are accepted by the County.

Contractor shall coordinate his work with the provider of any and all utilities located on the site that has the potential to have an impact on the work.

Contractor is responsible for locating tie in points, where applicable, to existing utilities and advising the Owner if existing utilities are not located as shown.

All water line piping is subject to inspection by jurisdictional regulating authorities. All site water line pipe installation inside the meter is subject to inspection by Cobb County Community Development or by the regulating authority in the governing jurisdiction. The Contractor shall contact the applicable regulating authorities to verify the inspection requirements. The Contractor shall obtain all permits required for site water and fire line piping at no additional cost to the Owner.

15. LOCKSETS

All locksets, latches, deadbolts, padlocks, and cores shall be manufactured by Dormakaba and be compatible with Cobb County Parks' keying system. No alternate products will be allowed. All keyed cylinders shall be provided with temporary construction cores for use during construction. Use of temporary plastic devices or methods other than temporary cores to secure and unlock doors is not allowed. The Contractor shall order the permanent cores from a Dormakaba supplier and pay for the cores. Contractor shall notify the Owner when cores are ordered. Upon receipt of the order, the Dormakaba supplier will contact the Owner and the Owner will issue keying instructions to the Dormakaba supplier. The Dormakaba supplier will deliver the permanent cores directly to the Owner. Owner shall be responsible for installing permanent (final) cores utilizing a core key provided by the Contractor. Permanent cores shall be the same finish as the lockset finish.

16. SCHEDULE OF VALUES

Contractor, after award of contract, shall submit a Schedule of Values in accordance with Article 15.2 of Chapter 3 of the Contract for Construction identifying costs for meaningful areas of the Work, such that progress payments can be easily evaluated, as determined by the County. The schedule of values shall be broken down in sufficient detail to facilitate thorough review.

The schedule of values shall specifically include any allowances and unit prices identified in the contract.

17. CONSTRUCTION LAYOUT

The Contractor is responsible for all construction layout and control for the project. Layouts of construction items must consider all elements of the Work adjacent and/or in close proximity; e.g. catch basins must be located for proper relationships with curb and gutter, etc.

The Contractor shall proceed with construction layout in such a manner that discrepancies between construction items, existing built features and site conditions that are in conflict with the plans may be examined by the Owner's Representative prior to construction of items in conflict. Failure to notify the Owner's Representative of conflicts prior to constructing items will result in all remedial actions being paid for by the Contractor including but not limited to additional materials, reinspection fees, professional service fees and survey cost by all parties to the projects.

18. TOPOGRAPHIC MAPPING

The Contractor shall visit the site to review the site topographic conditions and conduct verification surveys if so desired prior to the bid to verify the accuracy of the information provided. Topographic variations discovered after bidding will not be grounds for additional compensation.

19. GEOTECHNICAL REPORT

A subsurface investigation has been performed at the site and a report is attached (See Appendix A). This investigation was conducted, and the reports obtained, solely for design purposes and are not a part of the Contract Documents. The use and interpretation of this information will be entirely the responsibility of the using party. Neither the Owner nor any Designer on the project is responsible for variations in the subsurface conditions. Bidders shall decide for themselves the character of the material to be encountered.

20. EARTHWORK

Contractor is responsible for all grading shown on the plans, unless noted otherwise. The Contractor shall conduct his own quantity take-off based on the Bid Documents. Earthwork related quantities shown on the plans (if any) are provided for reference only and shall not be utilized for bidding purposes. Any haul off of excess materials or import of materials needed to complete the grading shall be by the Contractor. The Contractor is responsible for hauling the soil materials. Should the Contractor import materials from any other site, the Contractor shall provide sample(s) to the materials testing firm for testing and approval.

21. ACTIVE FACILITIES

The construction site will be accessed through the parking lot adjacent to and south of the Equipment Shop at 1792 County Services Parkway – See Appendix B. This facility and all facilities in the area will remain open and operational. Safety shall be a prime concern of the Contractor at all times. The Contractor shall be solely responsible for and have control over the means, methods, techniques, sequences, and procedures for coordinating and constructing the Work, including site safety and safety precautions and programs. The Contractor is responsible for providing any measures necessary to secure the jobsite and protect the safety of the Owner's employees utilizing the surrounding areas. The Contractor shall keep the work area and adjacent areas clean at all times. Clean up operations shall be conducted on a consistent basis. The Contractor shall conduct the construction operations with the appropriate level of care to ensure the safety of the anyone in the area surrounding the facility. Employees of the Contractor and any subcontractors shall be cognizant of the fact that PARKS will continue to conduct business and operations on the grounds and conduct themselves in an appropriate manner. Actions such as cursing and other unnecessary conduct will not be tolerated.

22. AS-BUILT DRAWINGS AND DOCUMENTATION

The Contractor is responsible for providing as-built documents required by Cobb County including the Storm Water Management Division of Cobb Water. The Contractor will submit these documents directly to design engineer for review and certification. The as-built documents will require survey confirmation (both elevation and location) by the Contractor and include but are not limited to: storm drainage pipes and structures, detention and water quality ponds and swales. The Contractor must contact Cobb Community Development to determine their requirements and submit all supporting documentation required. These as-built documents must be reviewed and approved by the Cobb County permitting and inspection authorities prior to

final acceptance by Cobb County PARKS. The Certificate of Occupancy for the building may not be issued until the as-built drawings and certifications are approved.

In addition, the Contractor is required to submit red line as-built drawings documenting all changes from the contract documents. Critical dimensions shall be included as well.

23. SCHEDULE

The anticipated schedule for the project is as follows:

Project Bids:	May 9, 2024
BOC Consideration:	June 11, 2024
Contracts Issue:	By June 14, 2024
Notice to Proceed	On or about September 11, 2024

The Owner reserves the right to revise the above schedule as needed. Upon award and issuance of a contract, the Contractor shall proceed in an expeditious manner to obtain all insurance and bonds for the project. Documentation will require various endorsements to document proof of insurance. Refer to the Sample Construction Contract in the Project Manual for additional information.

Notice to Proceed will be issued after all insurance documents, bonds and executed contracts have been returned to the Owner and upon execution by the Owner.

24. DURATION

The construction duration for the work in this contract is one hundred fifty (150) calendar days. Failure to substantially complete the work within 150 calendar days plus any approved extensions shall result in liquidated damages in the amount of Two Hundred Dollars (\$200.00) per calendar day. Final completion shall be reached within 30 days of substantial completion. Failure to reach final completion within that time period will result in liquidated damages of Two Hundred Dollars (\$200.00) per calendar day. Refer to the Sample Contract for Construction in the Project Manual for additional information concerning liquidated damages.

Arbitrary assignment of a contract extension to minor change order requests will be rejected. All requests for contract duration extension must include documentation that demonstrates the impact of the change on the critical path of the project. Any contract extension requests due to long lead items shall include documentation that the item in question was procured in a timely fashion.

25. FINAL ACCEPTANCE

All references to guarantee, warranty or payments that are commencing upon “Final Approval”, “Final Certificate for Payment”, or “Substantial Completion” or other similar wording shall commence upon acceptance of the Work by the County.

26. ALLOWANCE

The bid form has a \$15,000.00 allowance shown in the schedule to be utilized for unforeseen conditions. The sum of base bid amount plus the \$15,000.00 allowance shall be included in the **TOTAL BID (Base Bid plus Allowance)** on page 1 of the BID FORM. Spending for unforeseen conditions against the allowance must be approved by the Owner prior to proceeding with the work. All proposals for spending against the allowance shall be provided in sufficient detail per Article 9.5 of Chapter 3 contract.

The allowance shall be shown in the schedule of values for the project. All proposals for work to be paid from the allowance shall include direct costs but shall not include mark up of general conditions, overhead, profit, etc. by the Contractor. If the Contractor intends to collect a markup on the allowance, the mark up shall be included in the Base Bid Amount on the Bid Form. Proposals of work to be funded by the allowance from subcontractors may be marked up by the subcontractor the amount allowed by paragraph 4.4.2 of the sample contract for construction included in the project manual. Should the amount approved for the unforeseen conditions allowance costs be less than \$15,000.00 at the conclusion of the project, the difference will be returned to the Owner via a deductive change order.

27. INSURANCE LIMITS

The insurance limits provided in the Sample Contract for Construction contained within the bid documents shall govern over those limits shown in the Cobb County General Instructions For Bidders, Terms and Condition.

28. OMISSIONS

Omissions and Errors from the drawings, and /or specifications, or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and/or specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work, but they shall be performed as if fully and correctly set forth and described in the drawings and specifications

29. NOTICE OF COMMENCEMENT

The Contractor shall record a Notice of Commencement with the Cobb County Clerk of Superior Court within 15 days after the contractor physically starts work on the property. A copy of the recorded Notice of Commencement shall be provided to the Owner.

30. ADDENDA

The Procurement Services Department will take reasonable steps to ensure that known perspective bidders have all applicable addenda. **However, it is the ultimate responsibility of the bidder/proposer to ensure that they have all applicable addenda prior to bid/proposal submission.** All bidders/proposers are encouraged to contact the Procurement Services Department prior to finalizing their submission.

31. CERTIFICATE OF OCCUPANCY

It shall be the Contractor's responsibility to ensure all required inspections and submittals are completed in a timely manner in order to receive a Certificate of Occupancy or other acceptable final acceptance documents. The Contractor shall contact and coordinate with Cobb Community Development to identify all final inspections and submittals required. The Contractor shall obtain a final sign off from the Special Inspections testing firm (selected for and paid by the County) and submit it to the Designer for final review and certification. Upon completion of all inspections and submittal and approval of all required as built documents (see paragraph 21 above) or any other items required by the County, the Contractor shall pick up the Certificate of Occupancy from Cobb County Community Development and deliver it to Cobb County PARKS.

32. SALVAGED MATERIALS

Prior to demolition by the Contractor, the Owner reserves the right to salvage any items scheduled to be demolished. This includes but is not limited to (most commonly salvaged): fixtures within and around buildings, heating and air conditioning equipment, water heaters, sinks, light fixtures, doors and hardware. The Contractor shall remove and dispose of any remaining materials scheduled for demolition.

33. All references to "Engineer", "Landscape Architect", "Architect", or "Owner" in the Contract for Construction, drawings or in the specifications are deemed to mean the Program Manager and/or "Owner's representative", as designated by the County. Any references to "Professional" in the Contract for Construction, drawings or in the specification are deemed to include those represented by the definition of Professional in the Contract for Construction and/or the Program Manager and/or "Owner's Representative".

Cobb County General Instructions for Bidders, Terms and Conditions

I. Preparation of Bids

Each bidder shall examine the drawings, specifications, schedule, and all instructions. Failure to do so will be at the bidder's risk, as the bidder will be held accountable for their bid response.

Unit price for each quotation shall be shown and such price shall include packing unless otherwise specified, along with a total and grand total where applicable. In case of discrepancy between a unit price and extended price, the unit price will be presumed correct.

Each bidder shall furnish all information required by the bid form or document. Each bidder shall sign the bid and print or type his or her name on the schedule. The person signing the bid must initial erasures or other changes. An authorized agent of the company must sign bids.

Invitations to Bid issued by Cobb County are advertised on the Cobb County Internet site, <https://www.cobbcounty.org/procurement-services>, and on the Georgia Procurement Registry, and every Friday in the Cobb County legal organ, the Marietta Daily Journal.

II. Delivery

Each bidder should state the time of proposed delivery of goods or services. Words such as "immediate", "as soon as possible", etc. shall not be used. The known earliest date or the minimum number of calendar days required after receipt of order (delivery A.R.O.) shall be stated (if calendar days are used, include Saturday, Sunday and holidays in the number).

III. Explanation to Bidders

Any explanation desired by a bidder regarding the meaning or interpretation of the invitation for bids, drawings, specifications, etc. must be received by **5:00 PM on April 30, 2024** in order for a reply to reach all bidders before the close of the bid. Any information concerning an Invitation to Bid (ITB) will be furnished to all prospective bidders as an addendum if such information is necessary or if the lack of such information would be prejudicial to uninformed bidders.

Submit questions in writing to:
Cobb County Procurement Services Department
122 Waddell Street NE
Marietta, GA 30060
Fax: 770-528-8428
Email: procurementservices@cobbcounty.org

The written bid documents supersede any verbal or written communication between parties. Addenda are posted on the Procurement Services Department website: <https://www.cobbcounty.org/procurement-services>. Receipt of addenda shall be acknowledged in the bid. It is the bidder's ultimate responsibility to ensure that they have all applicable addenda prior to bid submittal.

IV. Submission of Bids

Bids shall be enclosed in sealed envelopes, addressed to the Cobb County Procurement Services Department with the name of the bidder, the date and hour of opening and the invitation to bid number on the face of the envelope. Bids must be received in the Procurement Services Department no later than the date and time (determined by the date/time stamp in the department) set forth in the Invitation to Bid. It is the sole responsibility of the bidder to ensure that his or her bid reaches the Procurement Services Department. Telegraphic/faxed bids will not be considered. Any addenda should be enclosed in the sealed envelopes as well. **All bids shall be submitted on the Bid Proposal Form. Any revisions made on the outside of the envelope will not be accepted.** The bids will be publicly opened and read at the time and place set forth in the Invitation to Bid.

Samples of items, when required, must be submitted within the time specified and, unless otherwise specified by the County, at no expense to the County. Unless otherwise specified, samples will be returned at the bidder's request and expense if items are not destroyed by testing. Items offered must meet required specifications and must be of a quality, which will adequately serve the use and purpose for which intended.

Full identification of each item bid upon, including brand name, model, catalog number, etc. must be furnished to identify exactly what the bidder is offering. The bidder must certify that items to be furnished are new and that the quality has not deteriorated so as to impair its usefulness.

If no items are bid on, the "Statement of No Bid" must be returned, with the envelope plainly marked "No Bid" including the bid number. Where more than one item is listed, any items not bid upon must be indicated "No Bid".

Unsigned bids will not be considered except in cases where bid is enclosed with other documents, which have been signed. The County will determine this.

Cobb County is exempt from federal excise tax and Georgia sales tax with regards to goods and services purchased directly by Cobb County. Suppliers and contractors are responsible for federal excise tax and sales tax, including any taxes for materials incorporated in County construction projects. Suppliers and contractors should contact the State of Georgia Sales Tax Division for additional information. Tax Exemption Certificates will be furnished upon request.

Except as otherwise provided by law, information submitted by a bidder in the bidding process shall be subject to disclosure after bid award in accordance with the Georgia Open Records Act. Proprietary information must be identified with the appropriate affidavit as required by the Georgia Open Records Act. Marking an entire bid as proprietary will be neither accepted nor honored.

Each Bidder is required to keep the contents of their bid confidential once it is submitted until the award to the successful Bidder is made. Releasing any information regarding the proposal to third parties or the media prior to the conclusion of the award process will be immediate grounds for the County to reject the bid as non-responsive.

V. Withdraw Bid Due to Errors

The bidder shall give notice in writing of his claim of right to withdraw his bid without penalty due to an error within two (2) business days (48 hours) after the conclusion of the bid opening. Bids may be withdrawn from consideration if the price was substantially lower than the other bids due solely to a mistake therein, provided the bid was submitted in good faith, and the mistake was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of work, labor or material made directly in the compilation of the bid, which unintentional arithmetic or unintentional omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the bid sought to be withdrawn. The bidder's original work papers shall be the sole acceptable evidence of error and mistake if he elects to withdraw his bid. If a bid is withdrawn under the authority of this provision, the lowest remaining responsive bid shall be deemed to be low bid. Bid withdrawal is not automatically granted and will be allowed solely at the discretion of Cobb County.

No bidder who is permitted to withdraw a bid shall, for compensation, supply any material or labor or perform any subcontract or other work agreement for the person or firm to whom the contract is awarded or otherwise benefit, directly or indirectly, from the performance of the project for which the withdrawn bid was submitted.

VI. Testing and Inspection

Since tests may require several days for completion, the County reserves the right to use a portion of any supplies before the results of tests are determined. Cost of inspections and tests of any item, which fails to meet specifications, shall be borne by the bidder.

VII. F.O.B. Point

Unless otherwise stated in the Invitation to Bid and any resulting contract, or unless qualified by the bidder, items shall be shipped F.O.B. Destination. The seller shall retain title for the risk of transportation, including the filing for loss or damages. The invoice covering the items is not payable until items are delivered and the contract of carriage has been completed. Unless the F.O.B. clause states otherwise, the seller assumes transportation and related charges either by payment or allowance.

VIII. Patent Indemnity

The Contractor guarantees to hold the County, its agents, officers, or employees harmless from liability of any nature or kind for use of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, articles or appliances furnished or used in the performance of contract, for which the contractor is not the patentee, assignee or licensee.

IX. Bid, Payment & Performance Bonds

A five percent (5%) bid bond, a one hundred percent (100%) performance bond, and a one hundred percent (100%) payment bond shall be furnished to Cobb County for any proposal as required in proposal documents. Failure to submit appropriate bonding will result in automatic rejection of proposal. Bonding company must be authorized to do business in Georgia by the Georgia Insurance Commission, listed in the Department of Treasury's

publication of companies holding certificates of authority as acceptable surety on Federal bonds and as acceptable reinsuring companies, and have an A.M. Best rating as stated in the insurance requirements of the solicitation. The bonds shall be increased as the contract amount is increased.

X. Insurance

A. Requirement:

Contractor shall procure and maintain in full force and effect for the duration of this Agreement, insurance protecting against claims for injuries to persons or damages to property which may arise from or in connection with performance of the Work hereunder by the Contractor, his agents, representatives, employees, or subcontractors.

B. Minimum Limits of Insurance:

Contractor shall maintain insurance policies with coverage and limits no less than:

- i. Commercial General Liability: \$1,000,000 combined single limit per occurrence for comprehensive coverage including bodily and personal injury, sickness, disease or death, injury to or destruction of property, including loss of use resulting therefrom, damage for premises/operations, products/completed operations, independent contractors and contractual liability (specifically covering the indemnity), broad-form property damage, and underground, explosion and collapse hazard. This coverage may be achieved by using an excess or umbrella policy. The policy or policies must be on “an occurrence” basis (“claims made” coverage is not acceptable).
- ii. Commercial Automobile Liability (owned, non-owned and hired): \$1,000,000 combined single limit per occurrence and for bodily and personal injury, sickness, disease or death, injury to or destruction of property, including loss of use resulting therefrom.
- iii. Workers' Compensation and Employers Liability: Workers' Compensation limits as required by the State of Georgia and Employers Liability of \$1,000,000 per occurrence or disease.
- iv. Professional Liability (Errors and Omissions) Coverage: \$2,000,000 per claim and in the aggregate is required, in the event a contractor is performing design, engineering or other professional services.
- v. Commercial Umbrella or Excess Liability Coverage: \$2,000,000 in liability excess coverage per occurrence above the contracts stated minimum coverage limits for Commercial General Liability, Commercial Automobile Liability, and the Workers' Compensation and Employers Liability policies of insurance. This may be satisfied by having the underlying liability limits that equal or exceed the combined amount of the underlying liability limits and umbrella coverage.

- vi. Builder's "All Risk" Insurance: In the event Contractor is performing construction services under the Contract, Contractor shall procure and maintain "All-Risk" Builder's insurance, written on a commercially recognized policy form, providing coverage for the Work performed under the contract, and the materials, equipment or other items incorporated therein, while the same are located at the construction site, stored off-site, or at the place of manufacture. The policy limit shall be in a minimum amount equal to the "full insurable value" of such equipment and 100% of the value of the Contract, including any additional costs which are normally insured under such policy. The insurance coverage shall include boiler and machinery insurance on a comprehensive basis and include coverage against damage or loss caused by earth movement (including but not limited to earthquake, landslide, subsidence and volcanic eruption), fire, flood, hurricanes, explosion, hail, lightning, weather, vandalism, malicious mischief, wind, collapse, riot, aircraft, smoke, or other cataclysmic events, and coverage against damage or loss caused by machinery accidents and operational and performance testing, commissioning and start-up, with extended coverage, and providing coverage for transit, with sub-limits sufficient to insure the full replacement value of the property or equipment removed from its site and while located away from its site until the date of final acceptance of the Work.

The making of progress payments to the Contractor shall not be construed as relieving the Contractor or its subcontractors or insurance carriers providing the coverage described herein for responsibility for loss or direct physical loss, damage or destruction occurring prior to final acceptance of the Work.

C. Deductibles and Self-Insured Retention

Any deductibles or self-insurance retentions must be declared to and approved by Owner so that Owner may ensure the financial solvency of the Contractor. At the option of Owner, either the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects Owner, its officers, officials, and employees; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses. Contractor shall pay all deductibles and be liable for all claims, losses and damages for which it self-insures.

D. Other Insurance Provisions

The policies are to contain, or be endorsed to contain, the following provisions:

- i. General Liability, Automobile Liability, and Umbrella/Excess Insurance
 - (a) Additional Insured Requirement. Cobb County, its elected and appointed officials, officers, boards, commissions, officers, employees, representatives, servants, volunteers and agents (hereinafter referred to as "Insured Party" or "Insured Parties") are to be **covered as additional insureds** as respects: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor, premises owned, leased, or used by the Contractor; and automobiles owned, leased, hired, or borrowed by the Contractor. The

coverage shall contain no special limitations on the scope of protection afforded to the Insured Parties. Nothing contained in this section shall be construed to require the Contractor to provide liability insurance coverage to the any Insured Party for claims asserted against such Insured Party for its sole negligence.

- (b) Primary Insurance Requirement. The Contractor's insurance coverage shall be primary and noncontributing insurance as respects to any other insurance or self-insurance available to the Insured Parties. Any insurance or self-insurance maintained by the Insured Parties shall be in excess of the Contractor's insurance and shall not contribute with it.
- (c) Reporting Requirement. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the Insured Parties.
- (d) Separate Coverage. Coverage shall state that the Contractor's insurance shall apply separately to each Insured Party against whom claim is made or suit is brought.
- (e) Defense Costs/Cross Liability. Coverage shall be provided on a “pay on behalf” basis, with defense costs payable in addition to policy limits. There shall be no cross-liability exclusion.

E. Workers' Compensation and Employers Liability Coverage

The Contractor shall have and maintain in full force and effect for the duration of this Agreement, insurance protecting against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work by the Contractor, its agents, representatives, employees or subcontractors. The insurer shall agree to waive all rights of subrogation against Owner, and its officers, officials, employees and volunteers for losses arising from the work performed by the Contractor for Owner.

F. Waiver of Subrogation

The insurers shall agree under each policy of insurance required by this Contract to waive all rights of subrogation against the Insured Parties for losses arising from work performed by the Contractor for Owner.

G. All Coverages

i. Notice Requirement.

Each insurance policy required by this Contract shall be endorsed to state that coverage shall not be suspended, voided, canceled, reduced in coverage or in limits except after thirty (30) days' prior written notice by certified mail, return receipt requested, has been given to Owner, in care of the Cobb County *insert department name and address.* Owner reserves the right to accept alternate notice terms and provisions provided they meet the minimum requirements under Georgia law.

(ii) Acceptability.

The insurance to be maintained by Contractor must be issued by a company licensed or approved by the Insurance Commissioner to transact business in the State of Georgia. Such insurance shall be placed with insurers with a Best's Policyholder's Rating of "A" or better and with a financial rating of Class VII or greater or be otherwise acceptable to Cobb County. All policies shall be subject to approval by Cobb County Attorney's Office as to form and content.

(iii) Failure of Insurers. The Contractor shall be responsible for any delay resulting from the failure of any insurer to furnish proof of coverage in the prescribed form.

H. Verification of Coverage

Contractor shall furnish Owner with certificates of insurance and endorsements to the policies evidencing all coverages required by this Contract. Additionally, the declarations page for each insurance policy listed on the certificate of insurance shall be submitted to Owner. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The certificates and endorsements shall be received and approved by Owner before any work commences. Owner reserves the right to require complete, certified copies of all required insurance policies at any time. The contractor shall provide proof that any expiring coverage has been renewed or replaced prior to the expiration of the coverage.

I. Subcontractors

Contractor shall include all subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverage for subcontractors shall be subject to all of the requirements stated in this Agreement, including, but not limited to, naming the Insured Parties as additional insureds.

XI. Award

Award will be made to the lowest responsive and responsible bidder. Conditional bids are not accepted. The quality of articles to be supplied, their conformity with the specifications, their suitability to the requirements of the County, and the delivery terms will be taken into consideration in making the award. The County may make such investigations as it deems necessary to determine the ability of the bidder to perform, and the bidder shall furnish to the County all such information and data for this purpose as the County may request. The County reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder fails to satisfy the County that such bidder is properly qualified to carry out the obligations of the contract. The County reserves the right to reject or accept any or all bids and to waive technicalities, informalities, and minor irregularities in the bids received in the County's sole discretion and best interest.

The Bidder does not have the exclusive right to fill all of the County's requirements for the goods or services awarded nor will the County be obligated to purchase the estimated annual quantity, or any quantity contained in the bid document.

The County reserves the right to make an award as deemed in its best interest, which may include awarding a bid to a single bidder or multiple bidders; or to award the whole bid, only part of the bid, or none of the bid to single or multiple bidders, based on its sole discretion of its best interest. In case of tie bid, the award will be made as follows:

1. The bid will be awarded to the in-county vendor.
2. The bid will be awarded to the in-state vendor.
3. The bid will be awarded to the vendor with the lesser total dollar volume.

The County reserves the right to award by line item to more than one vendor. The County reserves the right to negotiate a lower price than the bid award price on any line item with the successful vendor, should the quantity required significantly exceed those on the Invitation to Bid. If the County is unable to negotiate an acceptable price, it reserves the right to rebid the item(s) involved. If after the award of the bid there is a decrease in the price of a product from the manufacturer, or a rebate, the successful bidder will pass that price decrease and/or rebate onto the County.

Time payment discounts will be considered in arriving at net prices and in award of bids. Offers of discount for payment within ten (10) days following the end of the month are preferred.

It is the intent of Cobb County Government to award all contracts in a manner that promotes fair, equitable treatment of all contractors and sub-contractors without regard to race, color, creed, national origin, gender, age, or disability.

XII. Delivery Failures

Failure of a contractor to deliver within the time specified or within reasonable time as interpreted by the Procurement Services Director, or failure to make replacement of rejected articles/services when so requested, immediately or as directed by the Procurement Services Director, shall constitute authority for the Procurement Services Director to purchase in the open market articles/services of comparable grade to replace the articles/services rejected or not delivered. On all such purchases, the Contractor shall reimburse the County within a reasonable time specified by the Procurement Services Director for any expense incurred in excess of contract prices, or the County shall have the right to deduct such amount from monies owed the defaulting Contractor. Alternatively, the County may penalize the Contractor one percent (1%) per day for a period of up to ten (10) days for each day that delivery or replacement is late. Should public necessity demand it, the County reserves the right to use or consume articles delivered which are substandard in quality, subject to an adjustment in price to be determined by the Procurement Services Director.

XIII. County Furnished Property

No material, labor or facilities will be furnished by the County unless so provided in the invitation to bid.

XIV. Rejection of Bids

Failure to observe any of the instructions or conditions in this invitation to bid may constitute grounds for rejection of bid.

XV. Contract

Upon submitting a bid in response to an ITB containing a Cobb County Sample Contract as part of the requirements, it is understood that the bidder has reviewed the documents with the understanding that Cobb County requires that the successful bidder(s) shall enter into a contract that is substantially the same as the Sample Contract unless modified by agreement of the parties. If any exceptions are taken to any part of the Sample Contract, each exception must be stated in detail and submitted as part of the bid document. If no exceptions are stated, it is assumed that the bidder fully agrees to the Sample Contract in its entirety. The foregoing should not be interpreted to prohibit either party from proposing additional contract terms and conditions during negotiation of the final contract, and the County reserves the right to make changes to the Sample Contract. In no event is a bidder to submit its own standard contract terms and conditions as a response to this ITB.

The Price and all unit prices shown shall be deemed to include all costs of Contractor's performance of the Work as set forth in the bid documents, including, but not limited to, the costs of labor, supervision, travel, services, materials, equipment, tools, scaffolds, hoisting, transportation, storage, insurance and taxes.

Each bid is received with the understanding that selection as the successful bidder by the County does not constitute a written contract between the successful bidder and the County, but shall bind the bidder on his part to furnish and deliver the articles quoted at the prices stated in accordance with the conditions of said accepted bid upon execution of a written contract with the County authorized by the County Board of Commissioners and signed by the Chairman. Once a contract is executed by the proper authorities for each party, the County, on its part, may order from such contractor, and except for cause beyond reasonable control, pay for, at the agreed prices, all articles specified and delivered.

XVI. Non-Collusion

By submission of a bid, the vendor certifies, under penalty of perjury, that to the best of its knowledge and belief:

- (a) The prices in the proposal have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other vendor or with any competitor.
- (b) Unless otherwise required by law, the prices which have been quoted in the proposal have not been knowingly disclosed by the vendor prior to opening, directly or indirectly, to any other vendor or to any competitor.
- (c) No attempt has been made, or will be made, by the vendor to induce any other person, partnership, or corporation to submit or not to submit a proposal for the purpose of restricting competition.

Collusions and fraud in bid preparation shall be reported to the State of Georgia Attorney General and the United States Justice Department.

XVII. Conflict of Interest, Etc.

By submission of a bid, the responding firm certifies, under penalty of perjury, that to the best of its knowledge and belief:

1. No circumstances exist which cause a Conflict of Interest in performing the services required by this ITB, and
2. That no employee of the County, nor any member thereof, nor any public agency or official affected by this ITB, has any pecuniary interest in the business of the responding firm or his sub-consultant(s) has any interest that would conflict in any manner or degree with the performance related to this ITB.

By submission of a bid, the vendor certifies under penalty of perjury, that to the best of its knowledge and belief:

- (a) The prices in the bid have been arrived at independently without collusion, consultation, communications, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other vendor or with any competitor.
- (b) Unless otherwise required by law, the prices which have been quoted in the bid have not knowingly been disclosed by the vendor prior to opening, directly or indirectly, to any other vendor or competitor.
- (c) No attempt has been made, or will be made, by the vendor to induce any other person, partnership, or cooperation to submit or not to submit a bid for the purpose of restricting competition.

For any breach or violation of this provision, the County shall have the right to terminate any related contract or agreement without liability and at its discretion to deduct from the price or otherwise recover, the full amount of such fee, commission, percentage, gift, payment or consideration.

The successful responding firm shall require each of its sub-consultant(s) to sign a statement certifying to and agreeing to comply with the terms of the Sub-sections above.

XVIII. Default

The contract may be cancelled or annulled by the Procurement Services Director in whole or in part by written notice of default to the Contractor upon non-performance or violation of contract terms. An award may be made to the next low responsive and responsible bidder, or articles specified may be purchased on the open market similar to those so terminated. In either event, the defaulting Contractor (or his surety) shall be liable to the County for costs to the County in excess of the defaulted contract prices; provided, however, that the Contractor shall continue the performance of this contract to the extent not terminated under the provisions of this clause. Failure of the Contractor to deliver materials or services within the time stipulated on his bid, unless extending in writing by the Procurement Services Director, shall constitute contract default.

XIX. Disputes

Except as otherwise provided in the contract documents, any dispute concerning a question of fact arising under the contract which is not disposed of shall be decided after a hearing by the Procurement Services Director, who shall reduce his/her decision to writing and mail or otherwise furnish a copy thereof to the contractor. The decision of the Procurement Services Director shall be final and binding; however, the Contractor shall have the right to appeal said decision to a court of competent jurisdiction.

XX. Substitutions

Bidders offering and quoting on substitutions or who are deviating from the attached specifications shall list such deviations on a separate sheet to be submitted with their bid. The absence of such a substitution list shall indicate that the bidder has taken no exception to the specifications contained herein.

XXI. Ineligible Bidders

The County may choose not to accept the bid of a bidder who is in default on the payment of taxes, licenses, or other monies due to the County. Failure to respond three (3) consecutive times for any given commodity/service may result in removal from the supplier list under that commodity/service.

XXII. Alterations of Documents

Alterations of County documents are strictly prohibited and will result in automatic disqualification of the firm's solicitation response. If there are "exceptions" or comments to any of the solicitation requirements or other language, then the firm may make notes to those areas, but may not materially alter any document language.

XXIII. Termination for Convenience

The successful Bidder will be required to enter into a contract containing a provision for termination of the contract for the County's convenience. The following is a sample of the provision.

The County, by written notice, may terminate this contract, in whole or in part, when it is in the County's interest. If this contract is terminated, the County shall be liable only for goods or services delivered or accepted. The County Notice of Termination may provide the contractor thirty (30) days prior notice before it becomes effective. However, at the County's sole option a termination of convenience may be effective immediately and may apply to delivery orders (if applicable) or to the contract in whole.

XXIV. Inter-Governmental Agreement

Other cities and Authorities located in Cobb County will be allowed to purchase identical items at the same price and upon the same terms and conditions, pursuant to the Intergovernmental Cooperative Purchasing Agreements entered into between the BOC and Cobb County Governmental entities listed under the Intergovernmental Cooperative

Purchasing Program. These entities include the Cobb County Board of Education and Cities of Acworth, Austell, Kennesaw, Smyrna, Marietta, and Powder Springs and the Cobb County-Marietta Water Authority and the Cobb-Marietta Coliseum and Exhibit Hall Authority.

XXV. Indemnification

By submitting a Bid, the Bidder hereby agrees to indemnify, defend and hold harmless the County, its departments, employees and the Board of Commissioners from and against any and all claims, demands, liabilities, losses, costs or expenses, including attorneys' fees, due to liability to a third party or parties, for any loss due to bodily injury (including death), personal injury, and property damage, including but not limited to intellectual property claims, arising directly or indirectly from the submission of the Bid hereunder, but only to the extent such claims are caused by the negligence, recklessness or intentionally wrongful conduct of the Bidder or its agents, employees, associates, subcontractors or others working at the direction of Bidder. This indemnification obligation survives beyond the submission date of the Bid and the dissolution or, to the extent allowed by law, the bankruptcy of the Bidder.

XXVI. Indemnification and Hold Harmless

The Contractor covenants and agrees to take and assume all responsibility for the Work rendered in connection with this Agreement. The Contractor shall bear all losses and damages directly or indirectly resulting to it on account of the performance or character of the Work rendered pursuant to this Agreement. To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the County and the County's elected and appointed officials, officers, boards, commissions, employees, representatives, consultants, servants, agents and volunteers (individually an "Indemnified Party" and collectively the "Indemnified Parties") from and against any and all claims, suits, actions, judgments, injuries, damages, losses, expenses, and liability of any kind whatsoever, including but not limited to attorneys' fees and other legal expenses, ("Liabilities") to the extent caused by or resulting from negligence, recklessness, or intentionally wrongful conduct arising out of the Work, performance of contracted services, or operations by Contractor, any subcontractor, anyone directly or indirectly employed by the Contractor or subcontractor or anyone for whose acts the Contractor or subcontractor may be liable, regardless of whether or not the negligent act or omission is caused in part by a party indemnified hereunder. This indemnity obligation does not include Liabilities caused by or resulting from the sole negligence of an Indemnified Party. Such obligation shall not be construed to negate, abridge or otherwise reduce other rights or obligations of indemnity which would otherwise exist as to the party or person described in this Section XXIV.

In any and all claims against an Indemnified Party or Indemnified Parties by an employee of the Contractor, its subcontractors, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Section XXIV shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor, or its subcontractors, under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

This obligation to indemnify, defend and hold harmless the Indemnified Party and Indemnified Parties shall survive the expiration or termination of this Agreement provided that the claims are based upon or arise out of acts or omissions that occurred during the performance of this Agreement.

XXVII. Confidentiality

Contractor acknowledges that it may receive confidential information of the County and that it will protect the confidentiality of any such confidential information and will require any of its subcontractors, contractors, and/or staff to likewise protect such confidential information. The Contractor agrees that confidential information it receives or such reports, information, opinions, or conclusions that Contractor creates under this Agreement shall not be made available to, or discussed with, any individual or organization, including the news media, without prior written approval of the County. Contractor shall exercise reasonable precautions to prevent the unauthorized disclosure and use of County information whether specifically deemed confidential or not.

Contractor acknowledges that the County's disclosure of documentation is governed by Georgia's Open Records Act, and Contractor further acknowledges that, if Contractor submits records containing trade secret information and if Contractor wishes to keep such records confidential, Contractor must submit and attach to such records an affidavit affirmatively declaring that specific information in the records constitutes trade secrets pursuant to Article 27 of Chapter 1 of Title 10, and the Parties shall follow the requirements of O.C.G.A. § 50-18-72(a)(34) related thereto.

XXVIII. Small and Minority Business Participation

Cobb County Government encourages the participation of all businesses in offering their products and services with the goal of fairly and competitively procuring those products and services at the most reasonable cost. To that end, the County seeks to foster minority and women-owned business, and small business, opportunities in the award and implementation of contracts. The County seeks to build a diverse, inclusive, and prosperous group of suppliers who can effectively compete in business while obtaining quality goods and services in a competitive, efficient and non-discriminatory manner.

XXIX. Special Terms and Conditions

Should these General Terms and Conditions be in conflict with any attached Special Terms and Conditions, the Special Terms and Conditions will control.

**XXX. Compliance with Georgia Security and Immigration Compliance Act
PROCEDURES & REQUIREMENTS
(Effective 09-20-2013 - Supersedes All Previous Versions)**

BACKGROUND

Pursuant to the “Georgia Security and Immigration Compliance Act,” Cobb County cannot enter into a contract for the physical performance of services unless the contractor registers and participates in the federal work authorization program to verify information of all newly hired employees or subcontractors. Neither may any contractor or subcontractor enter a contract with the county in connection with the physical performance of services unless the contractor and/or subcontractor registers and participates in the federal work authorization program to verify information of all new employees. O.C.G.A. § 13-10-91.

Before any bid for the physical performance of services is considered, the bid must include a signed, notarized affidavit from the contractor attesting to the following: (1) the affiant has registered with and is authorized to use the federal work authorization program; (2) the user ID number and date of authorization for the affiant; and (3) the affiant is using and will continue to use the federal work authorization program throughout the contract period. O.C.G.A. § 13-10-91 (b) (1). Affidavits shall be maintained for five years from the date of receipt. O.C.G.A. § 13-10-91 (b) (1).

Upon contracting with a new subcontractor, a contractor or subcontractor shall, as a condition of the contract or subcontract, provide Cobb County with notice of the identity of any and all subsequent subcontractors hired or contracted by that contractor or subcontractor within five (5) business days of entering into a contract or agreement for hire with any subcontractor. Such notice shall include an affidavit including the subcontractor’s name, address, user ID number, and date of authorization to use the federal work authorization program. O.C.G.A. § 13-10-91 (b) (3).

Based upon the County’s experience and desire for full compliance, no work may be commenced by any subsequent subcontractor prior to notice being received by the County that the subcontractor (regardless of tier) is in compliance with the law and the attached Procedures & Requirements, including the preparation and submission of the Contractor (or Subcontractor) Affidavit & Agreement AND the Immigration Compliance Certificate PRIOR to the commencement of any work.

DEFINITIONS

Affidavit – a written statement made or taken under oath before an officer of the court or a notary public or other person who duly has been authorized so to act.

Affiant – the person who makes and subscribes to a statement made under oath (affidavit).

Physical Performance of Services – any performance of labor or services for a public employer using a bidding process or by contract wherein the labor or services exceed \$2,499.99.

PROCEDURES & REQUIREMENTS

1. Bid documents: Bid documents should contain information regarding the contract language and contractual requirements described below.
2. Responsive bid documents: Responsive bid documents MUST INCLUDE a signed, notarized affidavit from the contractor in the form attached as EXHIBIT A (CONTRACTOR AFFIDAVIT & AGREEMENT). **If the affidavit is not submitted at the time of the bid, the applicant will be disqualified.**

This Affidavit Must Be Signed, Notarized And Submitted With Any Bid Requiring The Performance Of Physical Services. If The Affidavit Is Not Submitted At The Time Of The Bid, The Bid Will Be Determined To Be Non-Responsive And Will Be Disqualified.

3. Contract Language & Contractual Requirements: Affirmative language shall be contained in agreements for the performance of services to cover all statutory and County requirements; such language shall require:
 - (a) That affidavits in the form attached to these “Procedures & Requirements” be executed from a contractor (and any subcontractors, regardless of tier) and notarized, showing compliance with the requirements of O.C.G.A. § 13-10-91 and that such be made part of the contract and/or subcontracts;
 - (b) That the contractor (and any subcontractors, regardless of tier) fully comply with the requirements for completing and submitting the “Immigration Compliance Certification” and that such certification be received by the County prior to the commencement of any work under the contract or subcontract;
 - (c) That the contractor (or any subcontractor, regardless of tier) notify the County within five (5) business days of entering into a contract or other agreement for hire with any subcontractor(s), regardless of tier;
 - (d) That the contractor be responsible for obtaining and providing to the County the “Subcontractor Affidavit & Agreement” and “Immigration Compliance Certification” attached to and required under these “Procedures & Requirements” from each subcontractor, regardless of tier, employed or retained for work under the contract prior to the commencement of any work under the contract or any subcontract;
 - (e) That Cobb County, Georgia, reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the required affidavit or certification and/or for failure to comply with the statutory requirements of O.C.G.A. § 13-10-91 and/or for providing false or misleading information upon the required affidavit(s) or certification(s);
 - (f) That any contractor and/or subcontractor retaining any other subcontractor to perform services under the contract provide legal notice to any subcontractor of the requirements of Cobb County for immigration compliance and further provide notice that Cobb County, Georgia, reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the required affidavit or certification and/or for failure to comply with the statutory requirements of O.C.G.A. § 13-10-91 and/or for providing false or misleading information upon the required affidavit(s) or certification(s);

(g) That failure to comply with any of the requirements and procedures of the County (i.e., failure to timely supply required affidavits or compliance certification documents; failure to utilize federal work authorization procedures; failure to permit or facilitate audits or reviews of records by County or State officials upon request; and/or failure to continue to meet any of the statutory or County obligations during the life of the contract) shall constitute a material breach of the agreement and shall entitle the County to dismiss any general contractor or to require the dismissal of any subcontractor or sub/subcontractor (irrespective of tier) for failing to fully comply with these requirements;

(h) That upon notice of a material breach of these provisions, the contractor (or subcontractor, regardless of tier) shall be entitled to cure the breach within ten (10) days and provide evidence of such cure. Should the breach not be cured, the County shall be entitled to all available remedies, including termination of the contract, the requirement that a subcontractor be dismissed from performing work under the contract, and any and all damages permissible by law.

4. Immigration Compliance Certification: Prior to commencing work under any contract for the physical performance of services, the contractor shall complete the “IMMIGRATION COMPLIANCE CERTIFICATION” form attached to these “Procedures & Requirements” and submit the same to the County.

Prior to allowing any other subcontractor to perform work under the contract, the contractor shall obtain a completed “IMMIGRATION COMPLIANCE CERTIFICATION” from each subcontractor (regardless of tier) and submit the same to the County.

FORM ATTACHMENTS:

1. CONTRACTOR AFFIDAVIT & AGREEMENT (EXHIBIT A);
2. SUBCONTRACTOR AFFIDAVIT & AGREEMENT (EXHIBIT A-1);
3. IMMIGRATION COMPLIANCE CERTIFICATION (EXHIBIT A-2).

**CONTRACTOR AFFIDAVIT & AGREEMENT
(EXHIBIT A)**

This affidavit must be signed, notarized and submitted with any bid requiring the performance of physical services. If the affidavit is not submitted at the time of the bid, the bid will be determined non-responsive and will be disqualified.

By executing this affidavit, the undersigned contractor verifies compliance with O.C.G.A. §13-10-91, stating affirmatively that the individual, firm or corporation which is contracting with Cobb County, Georgia, has registered with, is authorized to use, and is participating in a federal work authorization program (an electronic verification of work authorization program operated by the U.S. Department of Homeland Security or any equivalent federal work authorization program operated by the U.S. Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA)). The undersigned contractor further attests that it will continue to use the federal Employment Eligibility Verification (EEV) work authorization program throughout the contract period.

The undersigned further agrees that should it employ or contract with any subcontractor(s) or should its subcontractor(s) employ other subcontractor(s) for the physical performance of services pursuant to the contract with Cobb County, Georgia, the contractor or subcontractor will:

- (1) Notify the County within five business days of entering into a contract or agreement for hire with any subcontractor(s);
- (2) Secure from any subcontractor(s) and/or their subcontractor(s) verification of compliance with O.C.G.A. § 13-10-91 on the attached Subcontractor Affidavit (EXHIBIT A-1) prior to the commencement of any work under the contract/agreement;
- (3) Secure from any subcontractor(s) and/or their subcontractor(s) a completed Immigration Compliance Certification (EXHIBIT A-2) prior to the commencement of any work under the contract/agreement;
- (4) Provide the subcontractor(s) with legal notice that Cobb County, Georgia, reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the affidavit and/or for failure to comply with the requirements referenced in the affidavit;
- (5) Maintain records of such compliance and provide a copy of each such verification to Cobb County, Georgia, at the time the subcontractor(s) is retained to perform such services or upon any request from Cobb County, Georgia; and
- (6) Maintain such records for a period of five (5) years.

EEV (E-Verify) Program Number

EEV Program Date of Authorization

BY: Authorized Officer or Agent
[Contractor Name]

Contractor Business Name

Printed Name

Date

SWORN AND SUBSCRIBED BEFORE ME
ON THIS THE ____ DAY OF _____, 202__

Notary Public Commission Expires: _____

Effective 09-20-2013

**SUBCONTRACTOR AFFIDAVIT & AGREEMENT
(EXHIBIT A-1)**

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of Cobb County, Georgia, has registered with, is authorized to use, and is participating in a federal work authorization program (an electronic verification of work authorization program operated by the U.S. Department of Homeland Security or any equivalent federal work authorization program operated by the U.S. Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA)). The undersigned contractor further attests that it will continue to use the federal Employment Eligibility Verification (EEV) work authorization program throughout the contract period.

The undersigned further agrees that should it employ or contract with any subcontractor(s) or should its subcontractor(s) employ other subcontractor(s) for the physical performance of services pursuant to the contract with Cobb County, Georgia, the undersigned subcontractor will:

- (1) Notify the County within five business days of entering into a contract or agreement for hire with any subcontractor(s);
- (2) Secure from any subcontractor(s) and/or their subcontractor(s) verification of compliance with O.C.G.A. § 13-10-91 on this Subcontractor Affidavit form (EXHIBIT A-1) prior to the commencement of any work under the contract/agreement;
- (3) Secure from any subcontractor(s) and/or their subcontractor(s) a completed Immigration Compliance Certification (EXHIBIT A-2) prior to the commencement of any work under the contract/agreement;
- (4) Provide the subcontractor(s) with legal notice that Cobb County, Georgia, reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the affidavit and/or for failure to comply with the requirements referenced in the affidavit;
- (5) Maintain records of such compliance and provide a copy of each such verification to Cobb County, Georgia, at the time the subcontractor(s) is retained to perform such services or upon any request from Cobb County, Georgia; and
- (6) Maintain such records for a period of five (5) years.

EEV (E-Verify) Program Number

EEV Program Date of Authorization

BY: Authorized Officer or Agent
[Subcontractor Name]

Subcontractor Business Name

Printed Name

Date

SWORN AND SUBSCRIBED BEFORE ME
ON THIS THE ____ DAY OF _____, 202__

Notary Public Commission Expires: _____

Effective 09-20-2013

IMMIGRATION COMPLIANCE CERTIFICATION
(Required to be completed by Contractors and all Subcontractors)
(EXHIBIT A-2)

I certify to the Cobb County Board of Commissioners that the following employees will be assigned to:

(Project Name/Description)

I further certify to Cobb County, Georgia the following:

- The E-Verify program was used to verify the employment eligibility of each of the above-listed employees hired after the effective date of our contract to use the program;
- We have not received a Final Nonconfirmation response from E-Verify for any of the employees listed.
- If we receive a Final Nonconfirmation response from E-Verify for any of the employees listed above, we will immediately terminate that employee's involvement with the project.
- I have confirmed that we have an I-9 on file for every employee listed above and that to the best of my knowledge all the I-9s are accurate.
- To the best of my knowledge and belief, all of the employees on the above list are legally authorized to work in the United States.
- If any other employee is assigned to this Cobb County project, a certification will be provided for said employee prior to the employee commencing work on the project.

To the best of my knowledge and belief, the above certification is true, accurate and complete.

Sworn to by:

Employer Name & Address:

Signature of Officer

Printed Name/Title

Date

SWORN AND SUBSCRIBED BEFORE ME
ON THIS THE ____ DAY OF _____, 202_

Notary Public
Commission Expires: _____

Effective 09-20-2013

COBB COUNTY PARKS NEW MAINTENANCE BUILDING

BID FORM

BIDDERS NAME AND ADDRESS

TO: COBB COUNTY BOARD OF COMMISSIONERS

THE UNDERSIGNED HAVING EXAMINED THE PROPOSED CONTRACT DOCUMENTS TITLED:

COBB COUNTY PARKS NEW MAINTENANCE BUILDING
1792 County Services Parkway
Marietta, GA 30008
SEALED BID # 24-6827

AND HAVING VISITED THE SITE AND EXAMINED THE CONDITIONS AFFECTING THE WORK, HEREBY PROPOSES AND AGREES TO FURNISH ALL LABOR AND MATERIALS, EQUIPMENT, AND APPLIANCES AND TO PERFORM THE OPERATIONS NECESSARY TO COMPLETE THE WORK AS REQUIRED BY SAID PROPOSED CONTRACT DOCUMENTS, FOR ALL OF THE WORK IDENTIFIED AS TOTAL LUMP SUM QUOTE FOR ALL ITEMS AS SPECIFIED FOR THE STIPULATED SUM OF:

A. BASE BID AMOUNT

_____ Dollars (\$ _____)

B. PERMIT ALLOWANCE

Four Thousand Dollars _____ Dollars (\$ _____ 4,000.00)

C. UNFORESEEN CONDITIONS ALLOWANCE

Fifteen Thousand Dollars _____ Dollars (\$ _____ 15,000.00)

TOTAL BID (Base Bid Plus Allowances = A+B+C)

_____ Dollars (\$ _____)

COBB COUNTY PARKS NEW MAINTENANCE BUILDING

BID FORM

The undersigned understands and agrees also to comply with and be bound by the entire contents of the Project Manual.

The undersigned acknowledges receipt of Addenda numbers:

Company Name: _____

Signed: _____

Printed Name: _____

Date: _____

Title: _____

Address: _____

Phone Number: _____

Email Address: _____

END OF BID FORM

COBB COUNTY PARK NEW MAINTENANCE BUILDING

GENERAL CONTRACTOR'S QUALIFICATION STATEMENT – Use additional pages if necessary.

I. CONTRACTOR

Name of Contractor: _____

Address of Contractor: _____

Primary Contact Person: _____

Telephone Number: _____

II. BANK REFERENCE

Primary Bank: _____

Relationship officer responsible for account: _____

Telephone Number: _____

III. BACKGROUND

Has Contractor ever done business under a different name? _____

If so, provide names: _____

Prior projects with Cobb County: _____

SIMILAR PROJECT EXPERIENCE WITHIN THE PAST 5 YEARS –REFER TO SPECIAL TERMS AND CONDITIONS FOR QUALIFICATION REQUIREMENTS (Provide additional sheets if needed)

1. Name of project: _____

Summary Project Description: _____

Address of project: _____

Contact person with Owner: _____

Current phone number and email address: _____

Completion date: _____

2. Name of project: _____

Summary Project Description: _____

Address of project: _____

Contact person with Owner: _____

Current phone number and email address: _____

Completion date: _____

COBB COUNTY PARKS NEW MAINTENANCE BUILDING

3. Name of project: _____
Summary Project Description: _____
Address of project: _____
Contact person with Owner: _____
Current phone number and email address: _____
Completion date: _____

Bonding Co.: _____

Bonding Co. Agency: _____

State of Georgia General Contractor License #: _____

Type of Business Entity: _____ (Corporation, Sole Proprietorship,
Partnership, LLC,P.C.)

Individual Members of the Firm:

President of the Corporation:

Secretary of the Corporation

Corporation is organized under the Laws of the State of _____

Bid dated this _____ day of _____ 202_____

COBB COUNTY PARKS NEW MAINTENANCE BUILDING

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ as Principal, and _____ as Surety, are hereby held and firmly bound unto _____ as the OWNER, in the penal sum of \$ _____ for payment of which, well and truly made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed this _____ day of _____, 20_____. The Principal has submitted to _____ a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing for the _____

NOW, THEREFORE,

- (a) If said BID shall be rejected or
(b) If said BID shall be accepted and the principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID), and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID,

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

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

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____(L.S.)
Principal

_____(Seal)
Surety

By: _____ Seal

IMPORTANT - Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

**COBB COUNTY
BOARD OF COMMISSIONERS**

SAMPLE CONTRACT FOR CONSTRUCTION

**Cobb County PARKS Maintenance Building
PARKS Administration Complex
1792 County Services Pkwy
Marietta, GA 30008
BUILDER'S AGREEMENT**

This Contract for Construction is entered into between:

“OWNER” **COBB COUNTY BOARD OF COMMISSIONERS**
100 Cherokee Street, Marietta, GA 30060
and

“GENERAL CONTRACTOR or “BUILDER” – **BUILDER NAME**

This Contract for Construction is executed under seal, and shall be effective on the date signed by the Owner.

ADDRESSES AND AUTHORIZED REPRESENTATIVES

The authorized representatives and addresses of the Owner, the General Contractor and the Professional are:

OWNER: **COBB COUNTY BOARD OF COMMISSIONERS**
Representative: Jordan Wood
Address: Cobb County Parks, Recreation & Cultural affairs
1792 County Services Parkway
City, State, Zip: Marietta, GA 30008-4026
Office: Fax: 770.528.8807; 770.528.8801 (fax)
E-mail: jordan.wood@cobbcounty.org

GENERAL CONTRACTOR: **Contractor Name**
Representative:
Address:
City, State, Zip:
Office: Mobile: Fax:
E-mail:

General Contractor's FEIN:
PROFESSIONAL: Foreman Seely Fountain Architecture
Representative: Jerry Fountain
Address: 3091 Governors Lake Drive, # 150
City, State, Zip: Peachtree Corners, GA 30071
Office: 770-729-8433
E-mail: fountain@fsfarchitecture.com

SAMPLE CONTRACT FOR CONSTRUCTION

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Whenever this Contract for Construction refers to “Professional” in the singular, such reference shall mean the Owner’s designated representative.

OWNER’S PROJECT IDENTIFICATION INFORMATION:

Project Title: Cobb County PARKS New Maintenance Building

Project Location: PARKS Administration Complex

Address: 1792 County Services Pkwy
Marietta, GA 30008

GENERAL PROJECT DESCRIPTION:

1. For furnishing all labor, materials, equipment, appliances, etc. pursuant to the plans, specifications, conditions and addenda. The scope of work includes but is not limited to: a 6,000 SF pre-engineered maintenance building including foundation, slab and interior work; grading; erosion control; septic system; landscaping; exterior concrete pavement and pads; and water connection. The building will be located at 1792 County Services Parkway, Marietta, GA 30008 behind the existing Equipment Shop.

TIME FOR PERFORMANCE:

A. Commencement of Construction:

The General Contractor shall commence construction of its scope of the Work within 10 days from receipt of the Notice to Proceed.

B. Substantial Completion:

The General Contractor shall accomplish Substantial Completion of its scope of the Work as set forth in the Notice to Proceed (the “required date of Substantial Completion”).

C. Final Completion:

The General contractor shall accomplish Final Completion of its scope of the Work, as set forth in the Notice to Proceed (the “required date of Final Completion”).

RECITALS

A. The Owner intends to construct the Project and is engaging the General Contractor to perform certain labor, supervision and services and provide certain equipment, goods, and materials for the Project.

B. The Owner and General Contractor each acknowledge that it will act in good faith in carrying out its duties and obligations.

C. The Owner’s engagement of the General Contractor is based upon the General Contractor’s representations to the Owner that it (i) is experienced in the type of labor and services the Owner is engaging the General Contractor to perform; (ii) is authorized and licensed to perform the type of labor and services for which it is being engaged in the State and locality in which the Project is located; (iii) is qualified, willing and able to perform general construction services for the Project; and (iv) has the expertise and ability to provide general construction services which will meet the Owner's objectives and requirements, and which will comply with the requirements of all governmental, public and quasi-public authorities and agencies having or asserting jurisdiction over the Project.

- D. The Owner and General Contractor each acknowledge that it has reviewed and familiarized itself with this Contract for Construction, including the documents enumerated in Article 1, and agrees to be bound by the terms and conditions contained therein.
- E. The Owner has engaged one or more Professionals to perform architectural and/or engineering services for the Project, including preparation of site-specific Construction Documents.

NOW, THEREFORE, for good and valuable consideration, the parties agree as follows:

ARTICLE 1 CONTRACT DOCUMENTS

- 1.1 The “Contract for Construction” is comprised of the following documents:

This “Chapter 1 – Builder’s Agreement (General Contractor’s Form)” (hereafter “Chapter 1”), including the foregoing recitals A. through E., and all attached documents, appendices and addenda;

“Chapter 2 – Builder’s Required Services (General Contractor’s Form)” (hereafter “Chapter 2”), and all attached documents, appendices, exhibits, and addenda;

“Chapter 3 – General Terms and Conditions of Builder’s Contracts” (hereafter “Chapter 3”) and all attached documents, appendices, exhibits, and addenda;

Special Terms and Conditions, if any;

Request for Proposal # _____

Proposal dated **INSERT DATE** ,20 submitted by the General Contractor and accepted by the Owner;

Proposed modifications, if any, dated N/A _____;

The Construction Documents, now existing or issued hereafter, including but not limited to:

Construction Drawings dated January 13, 2023.

Project Manual dated **XXXXXXX**

Any bid alternates, amendments or addenda executed by the Owner and the General Contractor hereafter;

INSERT ALTERNATES HERE

Approved Change Order(s) or field orders; and

Additional documents, including addenda, listed hereafter, if any:

Addendum #1, issued <...>.

XXX

- 1.2 Documents not included or expressly contemplated in this Article 1 do not, and shall not, form any part of this Contract for Construction.

- 1.3 The Owner shall furnish the General Contractor with one reproducible copy of the Construction Documents.

ARTICLE 2 NOTICES

- 2.1 Unless otherwise provided, all notices shall be in writing and considered duly given if original is (i) hand delivered; (ii) delivered by facsimile with facsimile transmission receipt, or telecopy; (iii) delivered by email; or (iv) sent by U.S. Mail, postage prepaid. All notices shall be given to the addresses set forth above. Notices hand delivered or delivered by facsimile or email shall be deemed given the next business day following the date of delivery. Notices given by U.S. Mail shall be deemed given as of the second business day following the date of posting.

ARTICLE 3 SCOPE OF GENERAL CONTRACTOR'S WORK

- 3.1 The General Contractor shall furnish or cause to be furnished, and pay for out of the Construction Price, all management, supervision, financing, goods, products, materials, equipment, systems, labor, services, permits, licenses, construction machinery, water, heat, utilities, transportation and other facilities necessary for proper execution and completion of its scope of the Work in accordance with all of the terms and conditions of this Contract for Construction.

The Contractor is responsible for the entire project.

ARTICLE 4 COMPENSATION OF GENERAL CONTRACTOR

- 4.1 **Construction Price.** The Owner shall pay and the General Contractor shall accept, as full and complete payment for the General Contractor's timely, complete, and acceptable performance of its obligations hereunder the fixed price of: \$ _____ (_____). The amount set forth above is the Construction Price and includes the aggregate amount of all allowances and any unit price items to be furnished or installed pursuant to those shown on plans and specifications.

Construction Price includes Amounts in Unit Price and Lump Sum Allowances identified in the bid documents and Appendix A of Chapter 1 of this agreement.

- 4.2 **Compensation Schedule.** Within 10 calendar days after receipt of Notice to Proceed, the General Contractor shall prepare and present to the Owner and the designated Professional,

as Appendix A, the General Contractor's Compensation Schedule which includes, as applicable: *[Check applicable items]*

- A. Schedule of Values for payment of the Construction Price on a lump sum basis;
- B. Time Schedule for payment of the Construction Price on a lump sum basis;
- C. Unit prices and estimated number of units for compensation for services rendered and goods supplied on a unit-price basis; and
- D. Rates for compensation for services rendered on a time and material basis.
- E. Compensation for goods furnished on a time and material basis.
- F. Allowances.

4.3 **Payment.**

4.4 **Compensation for Change Orders.**

4.4.1 For change orders directed by a Professional to be performed by the General Contractor on a time and materials basis pursuant to Subparagraph 9.5.1 of Chapter 3, the General Contractor shall be reimbursed the actual incurred cost and expense plus a markup of fifteen percent (15%) for the change order Work performed by its forces.

4.4.2 When additional Work by the General Contractor's subcontractors and suppliers is required and approved pursuant to Subparagraph 9.5.3 of Chapter 3, the General Contractor shall be reimbursed the actual incurred costs and expenses paid to those subcontractors and suppliers, plus a markup of seven and one-half percent (7 ½%).

4.4.3 If the General Contractor disputes a change order decision pursuant to Paragraph 9.7 of Chapter 3, it must give the Owner its written notice of dispute, including the reasons therefore, within two (2) business days of the disputed decision.

4.5 **Liquidated Damages.** If liquidated damages are assessed pursuant to Chapter 3, Article 17, damages shall be calculated at the rate of TWO HUNDRED (\$200.00) Dollars per calendar day for failure to meet the required date of Substantial Completion and TWO HUNDRED (\$200.00) Dollars per calendar day for failure to meet the required date of Final Completion. If both the Substantial Completion and Final Completion dates have not been achieved, liquidated damages for default on the Substantial Completion and the Final Completion dates shall be added and shall be: FOUR HUNDRED (\$400.00) Dollars per calendar day until Substantial Completion is achieved; after which, the amount for failure to achieve Final Completion will continue to be paid as liquidated damages to the Owner until Final Completion.

ARTICLE 5 SPECIFIC INSURANCE REQUIREMENTS

5.1 Contractor shall procure and maintain in full force and effect for the duration of this Agreement, insurance protecting against claims for injuries to persons or damages to property which may arise from or in connection with performance of the Work hereunder by the Contractor, its agents, representatives, employees, or subcontractors.

- (i) Workers' Compensation and Employers Liability: Workers' Compensation limits as required by the State of Georgia and Employers Liability of \$1,000,000 per occurrence or disease.
- (ii) Commercial General Liability: \$1,000,000 combined single limit per occurrence for comprehensive coverage including bodily and personal injury, sickness, disease or death, injury to or destruction of property, including loss of use resulting therefrom, damage for premises/operations, products/completed operations, independent Contractors and contractual liability (specifically covering the indemnity), broad-form property damage, and underground, explosion and collapse hazard. This coverage may be achieved by using an excess or umbrella policy. The policy or policies must be on "an occurrence" basis ("claims made" coverage is not acceptable). The policy shall include a per location/per project aggregate, and completed operations coverage provided for a period of five (5) years after completion of the Work and final payment.
- (iii) Commercial Automobile Liability (owned, non-owned and hired): \$1,000,000 combined single limit per occurrence and for bodily and personal injury, sickness, disease or death, injury to or destruction of property, including loss of use resulting therefrom.
- (iv) Builder's "All Risk" Insurance: In the event Contractor is performing construction services under the Contract, Contractor shall procure and maintain on a Builders Risk "All-Risk" form insurance for physical loss or damage to the Work performed under the Contract, temporary buildings, and the materials, equipment or other items incorporated therein, while the same are located at the construction site, stored off-site, or at the place of manufacture. The policy limit shall be in a minimum amount equal to the "full insurable value" of such equipment and 100% of the value of the Contract, including any additional costs which are normally insured under such policy. The insurance coverage shall include boiler and machinery insurance on a comprehensive basis and include coverage against damage or loss caused by earth movement (including but not limited to earthquake, landslide, subsidence and volcanic eruption), fire, flood, hurricanes, explosion, hail, lighting, weather, theft, vandalism, malicious mischief, wind, collapse, riot, aircraft, smoke, or other cataclysmic events, and coverage against damage or loss caused by machinery accidents and operational and performance testing, commissioning and start-up, with extended coverage, and providing coverage for transit, with sub-limits sufficient to insure the full replacement value of the property or equipment removed from its site and while located away from its site until the date of final acceptance of the Work.

Owner and Contractor waive all rights against each other and any of their subcontractors, sub-subcontractors, agents, employees, each of the other, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section, or other property insurance applicable to the Work, except such rights as they have to the proceeds of such insurance.

The making of progress payments to the Contractor shall not be construed as relieving the Contractor or its subcontractors or insurance carriers from providing the coverage described herein for responsibility for loss or direct physical loss, damage or destruction occurring prior to final acceptance of the Work.

- (v) Other Insurance:

Commercial Umbrella or Excess Liability Coverage: \$2,000,000 per occurrence/\$2,000,000 general aggregate in liability excess coverage per occurrence above the contracts stated minimum coverage limits for Commercial General Liability, Commercial Automobile Liability, and the Workers' Compensation and Employers Liability policies of insurance. This may be satisfied by having the underlying liability limits that equal or exceed the combined amount of the underlying liability limits and umbrella coverage. The policy shall be written on a follow-form basis to the underlying coverages.

- 5.2 Each insurance policy required by this clause shall state or be endorsed to state that coverage shall not be suspended, voided, canceled, reduced in coverage or in limits for any reason, other than non-payment of premium, except after thirty (30) days prior written notice has been given to Certificate Holder (County). Certificate Holder (County) shall be given not less than 10 days prior written notice of cancellation for non-payment of premium.

The Certificates must include the Cobb County Project Name and Project Number. The Certificate Holder must be shown as:

Cobb County, GA
c/o PARKS
100 Cherokee Street
Marietta, GA 30060

The endorsements on the certificates must read as follows:

- (i) The certificate for All Coverage shall include the following Cancellation endorsement, worded exactly as follows: *“Coverage shall not be suspended, voided, canceled, reduced in coverage or in limits for any reason, other than non-payment of premium, except after thirty (30) days prior written notice has been given to Certificate Holder (County). Certificate Holder (County) shall be given not less than 10 days prior written notice of cancellation for non-payment of premium”.*
- (ii) The certificate for Worker’s Compensation and Employers’ Liability coverage shall include the following endorsement, worded exactly as follows: *“The insurer agrees to waive all rights of subrogation with respect to Worker’s Compensation and Employers’ Liability Coverage against the Owner, its officers, officials, employees, and volunteers for losses arising from work performed by the Design/Builder for the Owner.”*

ARTICLE 6

PERSONNEL, SUBCONTRACTOR, SUPPLIER AND CONSULTANT CHARTS

- 6.1 The General Contractor shall prepare and attach as Appendix B to this Chapter the General Contractor's Personnel Chart which lists by name, job category and responsibility the General Contractor's primary employees who will work on the Project, including a 24-hour contact number for each primary employee. The General Contractor shall promptly inform the Owner in writing of any proposed replacements, the reasons therefore, and the name(s) and

qualification(s) of proposed replacement(s). The Owner shall have the right to reject any proposed replacement.

- 6.2 The General Contractor (i) shall prepare and attach as Appendix C to this Chapter the General Contractor's Subcontractors and Suppliers Chart which lists by name and general Project responsibility each subcontractor and supplier who will be utilized by the General Contractor to provide goods or services with respect to the Project, including a 24-hour contact number for each Subcontractor and Supplier; (ii) shall not enter into any agreement with any subcontractor or supplier to which the Owner raises a reasonable, timely objection; and (iii) shall promptly inform the Owner in writing of any proposed replacements, the reasons therefore, and the name(s) and qualification(s) of proposed replacement(s). The Owner shall have the right to reject any proposed replacement.
- 6.3 The Owner shall prepare and attach as Appendix D to this Chapter the Owner's Consultants Chart which lists by name and general duties each consultant retained by the Owner to provide services with respect to the Project. The Owner reserves the right to engage any other consultants which it may deem necessary or desirable.

ARTICLE 7 CONSTRUCTION SCHEDULE AND SPECIFIC BOND REQUIREMENTS

7.1 Time for Performance.

7.1.1 **Commencement of Construction.** The General Contractor shall commence construction of its scope of the Work per the requirements stated in the Notice to Proceed (the "Commencement Date").

7.1.2. **Substantial Completion.** The General Contractor shall accomplish Substantial Completion of its scope of the Work per the requirements stated in the Notice to Proceed (the "required date of Substantial Completion").

7.1.3. **Final Completion.** The General contractor shall accomplish Final Completion of its scope of the Work per the requirements stated in the Notice to Proceed (the "required date of Final Completion").

7.2 **Construction Schedule.** The General Contractor shall prepare and submit a final Construction Schedule to the Owner and the Professional for their review and acceptance pursuant to Chapter 3, Paragraph 16.1 of this Contract for Construction no later than 10 days from receipt of the Notice to Proceed

7.3 Bond Requirements.

7.3.1 The General Contractor shall be required to provide payment and performance bonds. The amount of the premiums for such bonds shall be included in the Construction Price.

ARTICLE 8 AMENDMENTS TO CHAPTER 3

- 8.1 The following additions to, deletions from and/or modifications to the specifically referenced articles and paragraphs of Chapter 3 shall take precedence over the provisions of those referenced articles and paragraphs as follows:

Supplementary Conditions: See Special Terms and Conditions in the Project Manual

SAMPLE

GENERAL CONTRACTOR: Contractor Name _____

By: _____ Date: _____

Title: _____
(SEAL, IF INCORPORATED)

Attest:

By: _____ Date: _____
Corporate Secretary

**APPROVED AS TO FORM:
COUNTY ATTORNEY'S OFFICE**

By: _____ Date: _____
Attorney

**COUNTY:
COBB COUNTY, GEORGIA**

By: _____ Date: _____
Lisa N. Cupid
Title: Chairwoman
Board of Commissioners
(COUNTY SEAL)

Attest: _____ Date: _____
County Clerk

**APPENDIX A
GENERAL CONTRACTOR'S COMPENSATION SCHEDULE**

- A. Schedule of Values for payment of the Construction Price on a lump sum basis
(Separate attachment furnished by Contractor)
- B. Allowances:

<u>Description</u>	<u>Quantity Included in Base Bid</u>	<u>Unit Price</u>	<u>Units</u>	<u>Amount in Base Bid</u>
--------------------	--------------------------------------------------	-------------------	--------------	-------------------------------

ALLOWANCE SCHEDULE

A. UNFORESEEN ALLOWANCE	CONDITIONS	1	Lump Sum	\$ 15,000.00
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PERMIT ALLOWANCE SCHEDULE

B. PERMIT ALLOWANCE		1	Permit Fees	\$ 4,000.00
---------------------	--	---	-------------	-------------

TOTAL ALLOWANCES INCLUDED IN THE BASE BID (A THROUGH B): \$ 19,000.00

- C. Unit prices and estimated number of units for compensation for services rendered and goods supplied on a unit price basis: See Unit Price Allowance Schedule above.
See Unit Price Allowance Schedule above

APPENDIX B
GENERAL CONTRACTOR'S PERSONNEL CHART

For each of the General Contractor's primary employees working on the Project, list:

- 1) Name:
Job Category:
Responsibility:
24 hour contact number:
- 2) Name:
Job Category:
Responsibility:
24 hour contact number:
- 3) Name:
Job Category:
Responsibility:
24 hour contact number:

SAMPLE

**APPENDIX C
GENERAL CONTRACTOR'S
SUBCONTRACTORS AND SUPPLIERS CHART**

SAMPLE

**APPENDIX D
OWNER'S CONSULTANTS CHART**

Lists by name and general duties each consultant retained by the Owner to provide services with respect to the Project.

Program Manager: Atlas Technical Consultants, LLC
2450 Commerce Avenue, Suite 100
Duluth, GA 30096
770-263-5945

Contacts: Barbara Savage
770-528-8820
678-910-6814

Designer: Foreman Seely Fountain Architecture
3091 Governors Lake Drive, #150
Peachtree Corners, GA 30071
Contact: Jerry Fountain
770-729-8433

SAMPLE

Chapter 2

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**COBB COUNTY
BOARD OF COMMISSIONERS**

SAMPLE CONTRACT FOR CONSTRUCTION

**CHAPTER 2
BUILDER'S REQUIRED SERVICES**

**ARTICLE 1
GENERAL PROJECT SERVICES**

- 1.1 **Essential Services.** The General Contractor agrees to provide all services required to professionally complete its scope of the Work in an expeditious and economical manner consistent with this Contract for Construction and the best interests of the Owner.
- 1.2 **Compliance With Contractual Requirements.** At all times the General Contractor is performing services, it shall comply with the requirements set forth in Chapter 1, Chapter 2 and Chapter 3 of this Contract for Construction.
- 1.3 **Cooperative Effort.** The General Contractor shall, in consultation with the Owner, Professional(s), and the subcontractors, endeavor to develop, implement and maintain a spirit of cooperation, collegiality, and open communication among the parties so that the goals and objectives of each are clearly understood, potential problems are resolved promptly, and, upon completion, the Project is deemed a success by all parties.
- 1.4 **Relationship to Professional.** The Owner's designated professional will be the Owner's representative in dealing with the General Contractor on all design and technical matters and will administer this Contract for Construction. Unless otherwise directed by the Owner, the Owner and the General Contractor shall communicate with each other in the first instance through the designated Professional. The Owner's instructions to the General Contractor will be issued through the designated Professional.
- 1.5 **Additional Or Modified Required Services.** Additional or modified required services, if any, included in General Project Services are listed in Appendix 1 and incorporated herein by reference.

**ARTICLE 2
PRE-CONSTRUCTION SERVICES**

- 2.1 **Construction Documents Review.**
 - 2.1.1 Prior to commencement of construction activities the General Contractor shall review the Construction Documents for clarity, adequacy of detail, consistency, accuracy, and completeness to identify:
 - (i) conflicts, omissions or overlaps, and unusual design details affecting construction cost and schedules; and

- (ii) factors with the potential to impact the Construction Schedule such as materials with long lead time, the unavailability of required labor, and other factors and make suggestions for acceptable alternatives.
- 2.1.2 Upon completion of its review of the Construction Documents, the General Contractor shall:
 - (i) notify the Professional in writing of all problems, conflicts, defects, omissions, overlaps or deficiencies of which it became aware; and
 - (ii) assist the Professional with the resolution of the identified problems, conflicts, defects, omissions, overlaps and deficiencies.
- 2.2 **Scheduling.** The General Contractor understands and acknowledges the Owner's intent that the Project will be complete by the Date of Substantial Completion. The General Contractor shall timely prepare and submit the Construction Schedule for the Owner's review and approval.
- 2.3 **Additional or Modified Required Services.** Additional or modified required services, if any, included in Pre-Construction Services are listed in Appendix 1 and incorporated herein by reference.

ARTICLE 3 CONSTRUCTION SERVICES

- 3.1 **Construction Supervision.**
 - 3.1.1 The General Contractor shall supervise and direct its scope of the Work at the Site. The General Contractor shall, at a minimum, staff the Project Site with personnel who shall:
 - (i) supervise and coordinate the General Contractor's personnel and act as its primary liaison with the Owner and the Owner's Consultant(s).
 - (ii) coordinate trade contractors and suppliers and supervise Site construction services.
 - (iii) be familiar with all trade divisions and trade contractors' scopes of Work, all applicable building codes, the Construction Documents, and this Contract for Construction.
 - (iv) check and review shop drawings and materials delivered to the Site, regularly review the Work to determine its compliance with the Construction Documents and this Contract for Construction, periodically confer with the appropriate Owner's consultant(s) to assure acceptable levels of quality; and
 - (v) prepare and maintain Project records, process documents, and staff the Site field office.
 - 3.1.2 The General Contractor shall promptly reject any Work (a) which does not conform to the Construction Documents; or (b) which does not comply with any applicable

law, statute, building code, rule or regulation of any public authority or agency of which it is aware.

3.1.3 The General Contractor shall comply with and cause its subcontractors and suppliers to comply with the Project Construction Schedule and applicable sub-schedules. The General Contractor shall obtain and review schedules from subcontractors and suppliers, coordinate sub-schedules with the Construction Schedule, and enforce compliance with all applicable schedules to insure timely completion of the Work. If at any time a Project is delayed, the General Contractor shall immediately notify the Owner of the probable cause(s) and possible alternatives and make recommendations to minimize expense to the Owner.

3.1.4 The Professional will visit the Project Site at intervals appropriate to the stage of construction and with sufficient frequency to familiarize itself with the progress and quality of the Work and to inspect the Work. The Professional's interpretations and decisions shall be final regarding the Construction Documents and the Work.

3.2 **General Contractor's On-Site Facilities.** Commencing at the Date of Commencement and terminating on the Date of Final Completion, the General Contractor shall provide a Site field office and toilet facilities at the Project Site.

3.2.1 The field office facilities shall be large enough to accommodate required meetings and shall include office furnishings and equipment such as desks, telephones, computers, copiers, and other similar office equipment.

3.2.2 The General Contractor shall maintain in the Site field office, on a current basis, all necessary Construction Documents, schedules, shop drawings, product data, samples, purchase orders, maintenance manuals and instructions, daily logs, correspondence, memoranda, and all other Project-related documents.

3.2.3 The General Contractor shall provide temporary toilets at the Site for all workers for the duration of the construction period.

3.3 **Additional or Modified Required Services.** Additional or modified required services, if any, included in Construction Services are listed in Appendix 1 and incorporated herein by reference.

ARTICLE 4 EXTRA SERVICES

4.1 **Initiation of Extra Services.** The General Contractor shall provide such Extra Services as are initiated and authorized in writing by the Owner prior to performance. The services described in this Article 4 are not included in Required Services unless identified as an "Additional or Modified Required Service".

4.2 **Definition of Extra Services.** Extra services include, but are not limited to:

(i) services performed after the Date of Final Completion, except when required as Basic Services.

- (ii) services for preparation for and attendance at deposition, discovery or court or other dispute resolution proceedings on behalf of the Owner, except when such proceedings involve issues of fault, neglect or alleged liability of the General Contractor, or its agents, employees, or consultants.
- (iii) other services not included in Required Services mutually agreed to by the Owner and the General Contractor in writing.

4.3 Payment of the General Contractor for Extra Services shall be in accordance with applicable provisions of Chapter 1.

SAMPLE

APPENDIX 1

ADDITIONAL OR MODIFIED REQUIRED SERVICES

GENERAL PROJECT SERVICES [¶ 1.5]

None

PRE-CONSTRUCTION SERVICES [¶ 2.3]

None

CONSTRUCTION SERVICES [¶ 3.3]

None

SAMPLE

Chapter 3

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**COBB COUNTY
BOARD OF COMMISSIONERS**

**SAMPLE CONTRACT FOR CONSTRUCTION
CHAPTER 3
GENERAL TERMS AND CONDITIONS**

**ARTICLE 1
CONTRACT DOCUMENTS**

- 1.1 **Additional Sets of Documents.** Any additional copies of the Construction Documents required by the Builder for execution of the Work shall be made by the Builder at its cost and expense from the reproducible set(s) furnished by the Owner.
- 1.2 **Return of Document to Owner.** The Builder shall return to the Owner the reproducible set(s), and all copies, of the Construction Documents upon Final Completion of the Work or termination of this Contract for Construction.
- 1.3 **Electronic Media.** Unless otherwise specified in this Contract for Construction, the Builder may request that the Construction Documents required by the Builder for the Work be furnished to it on electronic media. To the extent that such documents are available on electronic media, the Builder will be furnished one set of the requested information on electronic media. Any additional electronic copies of Construction Documents required by the Builder for execution of the Work shall be made by the Builder at the Builder's cost and expense. The Builder shall return one copy of electronic Construction Documents to the Owner upon final acceptance of the Work or termination of this Contract for Construction, whichever occurs first, and shall destroy all remaining electronic copies of the documents within its possession.
- 1.4 **Minimum Requirements.** In every case, requirements established by the Construction Documents shall be considered as the minimum which will be accepted.
- 1.5 **Owner Disclaimer of Warranty.** The Owner has requested that its Professional(s) prepare documents for the Project, including the plans and specifications for the Project, which are to be complete, accurate, coordinated, and adequate for bidding, negotiating, and constructing the Work. However, the Owner makes no representation or warranty of any nature whatsoever to the Builder concerning such documents. The Builder hereby acknowledges and represents that it has not relied, and does not and will not rely, upon any representations or warranties by the Owner concerning such documents, as no such representations or warranties have been or are hereby made.
- 1.6 **Conflicts in Documents.** In the event of any conflict, discrepancy, or inconsistency among any of the documents which make up this Contract for Construction, the following shall control:
 - 1.6.1 As between figures given on plans and scaled measurements, the figures shall govern;
 - 1.6.2 As between large-scale plans and small-scale plans, the large-scale plans shall govern;

- 1.6.3 As between plans and specifications, the requirements of the specifications shall govern;
- 1.6.4 As between this document and the plans, specifications, general conditions or general requirements, this document shall govern.
- 1.7 **Shop Drawings and Submittals.** Shop drawings and other submittals from the Builder or its subcontractors and suppliers do not constitute a part of this Contract for Construction.
- 1.8 **Contract Changes.** The Builder understands and agrees that this Contract for Construction cannot be changed except as provided herein. No act, omission, or course of dealing by the parties shall alter the requirement that modifications of this Contract for Construction can be accomplished only by written documents signed by the parties.

ARTICLE 2 BUILDER'S REVIEWS AND EVALUATIONS

- 2.1 **Sufficiency of Construction Documents and Drawings.** The Builder acknowledges its continuing duty to review and evaluate the Construction Documents during the performance of its services and shall immediately notify the Owner and the Professional(s) about any (i) problems, conflicts, defects, deficiencies, inconsistencies, or omissions it discovers in or between the Construction Documents; and (ii) variances it discovers between the Construction Documents and applicable laws, statutes, building codes, rules, and regulations.
- 2.1.1 If the Builder performs any Work which it knows or should have known involves (i) a recognized problem, conflict, defect, deficiency, inconsistency or omission in the Construction Documents; or (ii) a variance between the Construction Documents and requirements of applicable laws, statutes, building codes, rules and regulations, without notifying the Professional(s) and prior to receiving written authorization from the appropriate Professional(s) to proceed, the Builder shall be responsible for the consequences of such performance.
- 2.1.2 Drawings are generally drawn to scale; however, the figured dimensions or notes thereon shall govern. Before ordering any materials or doing any Work, the Builder and subcontractors shall verify all measurements at the Site and shall be responsible for the correctness of same. Discrepancies shall be reported in writing to the Professional prior to proceeding with the Work. No extra charge or compensation will be entertained due to differences between actual measurements and dimensions indicated on drawings, if such differences do not result in a change in the scope of Work or if the Professional failed to receive written notice before the Work was performed.
- 2.2 **Sufficiency of Site.** Prior to signing this Contract for Construction, the Builder has
- (i) visited the Site and become familiar with local conditions under which the Project is to be constructed and operated; and
 - (ii) reviewed and familiarized itself with the Site survey and any existing structures on the Site and gathered all other information necessary for a full understanding of the Work.

In addition, if the Work involves modifications to or remodeling of an existing structure(s) or other man-made feature(s) on the Site, the Builder has also

- (iii) reviewed all available as-built and record drawings, plans and specifications; and
- (iv) thoroughly inspected the structure(s) and man-made feature(s) to be modified or remodeled prior to submission of bid, if any, but in all events prior to signing this Contract for Construction.

Claims resulting from the Builder's failure to familiarize itself with the Site or pertinent documents shall be deemed waived.

ARTICLE 3 BUILDER'S DUTIES, OBLIGATIONS AND RESPONSIBILITIES

3.1 **Performance of Work.** The Builder shall perform and complete its obligations under this Contract for Construction using its best skill and attention, and covenants with the Owner to furnish management, supervision, coordination, labor and services (i) which expeditiously, economically and properly completes the Work in the manner most consistent with the Owner's interests and objectives; (ii) which comply with the Construction Documents and this Contract for Construction; and (iii) and which accomplishes the Work in accordance with the highest standards currently practiced by persons and entities performing or providing management, supervision, coordination, labor and services on projects similar in size, complexity and cost to the Project.

3.1.1 The Builder shall not be required to provide professional services which constitute the practice of architecture or engineering.

3.1.2. All services rendered by the Builder for the Project shall be performed by or under the immediate supervision of persons possessing expertise in the discipline of the service being rendered.

3.1.3 The Builder shall, in the course of providing the Work, cooperate and communicate with the Owner and all other persons or entities as required for satisfactory completion of the Project.

3.1.4 The Builder understands and acknowledges that the Work referred to in this Contract for Construction may be only part of the Project and that the Project may include the construction of other structures or other construction activities on the same Site. The Builder shall conduct all its activities so as not to interfere with the construction of, or operations within or from, other structures on the Site.

3.1.5 The Builder shall not damage, endanger, compromise, or destroy any part of the Project or the Site, including by way of example and not limitation, work being performed by others on the Site, monuments, stakes, benchmarks and other survey points, utility services, and existing features or structures on the Site. Should the Builder damage, compromise or destroy any part of the Project or the Site, the Builder shall be fully and exclusively responsible for and bear all costs associated therewith.

3.2 **Compliance With Governmental Requirements.** The Builder shall:

- (i) comply with all applicable laws, statutes, building codes, rules, regulations and lawful orders of all governmental, public and quasi-public authorities and agencies having jurisdiction over the Project;
 - (ii) prepare and file documents required to obtain, and shall obtain, all necessary approvals and permits, including building permit(s), of all governmental authorities having jurisdiction over the Work; and
 - (iii) give all notices required of it by governmental authorities relating to the Project.
- 3.3 **Safety.** Safety shall be a prime concern of the Builder at all times. The Builder shall be solely responsible for and have control over the means, methods, techniques, sequences, and procedures for coordinating and constructing the Work, including Site safety and safety precautions and programs.
- 3.4 **Concurrent Records.** The Builder shall, concurrently with performance, maintain detailed records of activities on the Site. The Builder shall keep full and accurate records of all costs incurred and items billed in connection with the performance of the Work, which records shall be open to audit by the Owner or its authorized representatives during the performance of the Work and until three (3) years after Final Payment. In addition, the Builder shall make it a condition of all subcontracts relating to the Work that any and all Subcontractors will keep accurate records of costs incurred and items billed in connection with their work and that such records shall be open to audit by the Owner or its authorized representatives during performance of the Work and until two (2) years after its completion.
- 3.5 **As-Built Drawings.** The Builder shall maintain at the Site one copy of all drawings, specifications, addenda, approved shop drawings, change orders, submittals, and other modifications in good order and accurately marked depicting all changes as they occur during construction. The as-built drawings shall be available at all times to the Owner, the Professional(s), the Owner's consultants, and quality control and testing agency personnel. The drawings shall be neatly and clearly marked in color during construction to record all variations made during construction, and the Builder shall include such supplementary notes and details necessary to clearly and accurately represent as-built construction.
- 3.6 **Bribes and Kick-Backs.** The Builder shall not by any means:
- (i) induce any person or entity employed in the construction of the Project to give up any part of the compensation to which that person or entity is entitled;
 - (ii) confer on any governmental, public or quasi-public official having any authority or influence over the Project, any payment, loan, subscription, advance, deposit of money, services or anything of value, present or promised;
 - (iii) offer nor accept any bribes or kick-backs in connection with the Project from or to any individual or entity, including any of its trade contractors, subcontractors, consultants, suppliers or manufacturers of Project goods and materials; or
 - (iv) without the express written permission of the Owner, call for or by exclusion require or recommend the use of any subcontractor, consultant, product, material, equipment, system, process or procedure in which the Builder has a direct or indirect proprietary or other pecuniary interest.
- 3.7 **Quality Control and Testing.** The Builder shall develop and implement a quality management program to insure quality construction. Unless otherwise specified in this

Contract for Construction, the Owner shall select the quality control and testing agencies and pay for the cost of specified measures and tests required by the Construction Documents. The Builder shall coordinate all tests and inspections required by the Construction Documents, and the Builder shall arrange for tests and inspections to be conducted as necessary to avoid any interference with the progress of Work. No claims for extension of time or extra costs will be allowed on account of any testing, retesting, inspection, re-inspection, or rejection of Work when defective or deficient Work is found.

- 3.8 **Incident Reporting.** The Builder shall immediately notify the Owner and Professional(s), both orally and in writing, of the nature and details of all incidents which may adversely affect the quality or progress of the Work including, but not limited to, union jurisdictional disputes, accidents, delays, damages to Work and other significant occurrences.
- 3.9 **Hazardous Substances.** The Builder shall immediately notify the Owner and the Professional(s), both orally and in writing, of the presence and location of any physical evidence of, or information regarding, environmental contamination on the Site (including but not limited to Hazardous Substances and petroleum releases) of which it becomes, or reasonably should have become, aware. If the Builder encounters environmental contamination (including but not limited to Hazardous Substances and petroleum releases), the Builder shall (i) immediately stop performance of Work or that portion of the Work affected by or affecting such contamination; (ii) secure the contaminated area against intrusion; (iii) not disturb or remove the contamination; (iv) not proceed, or allow any subcontractor or supplier to proceed, with any Work or other activities in the area affected by such contamination until directed to do so by the Owner; and (v) take any other steps necessary to protect life and health.
- 3.10 **Owner's Use of and Access to The Site.** The Builder shall perform the Work so as not to interrupt any operations of the Owner on the Site.
- 3.10.1 The Builder understands and acknowledges that the Owner may need access to or use of certain areas of the Site or Work prior to the Builder's achievement of Substantial Completion, and that such occupancy, access, or use shall not constitute the Owner's acceptance of any Work.
- 3.10.2 The Builder shall not enter any Owner-occupied area of the Site or Project unless first approved and scheduled by the Owner. The Builder understands and acknowledges that the Owner may incur damages if the Owner's operations on the Site are interrupted or impaired as a result of the Work.
- 3.10.3 The Builder shall afford the Owner's own forces, and other consultants, trade contractors, subcontractors and suppliers, access to the Site for performance of their activities, and shall connect and coordinate its construction and operations with theirs as required by the Construction Documents.
- 3.11 **Commissioning.** The Builder shall, through the Owner's Representative, schedule and coordinate all equipment and systems start-ups and Project commissioning within its scope of the Work.
- 3.11.1 The Builder shall provide the Owner with operation and maintenance manuals and other operational documentation not less than twenty-eight calendar days prior to the required date of Substantial Completion to allow adequate time for training prior to commissioning and the Owner's occupancy of the Project.

- 3.11.2 The Builder shall meet with the Owner’s personnel not less than twenty-eight (28) calendar days prior to the required date of Substantial Completion to familiarize and train them with respect to maintenance and use of the Project. The appropriate Professional(s) will attend and assist with such familiarization and training.

**ARTICLE 4
BUILDER'S PERSONNEL, SUBCONTRACTORS, SUPPLIERS**

AND SITE FACILITIES

- 4.1 **Project Staffing.** The Builder shall staff the Project with qualified and designated individuals and entities responsible for its obligations and performance.
- 4.1.1 The Builder shall name a representative (the “Builder’s Representative”) to serve as its primary communication contact with the Owner and the Professional(s).
- 4.1.2 The Builder shall employ persons skilled in the tasks assigned to them and shall contract with subcontractors and suppliers skilled in the tasks assigned to them and capable of working harmoniously with all trades, crafts, and other individuals on the Project. The Builder shall use its best efforts to minimize the likelihood of any strike, work stoppage or other labor disturbance.
- 4.1.3 The Builder shall immediately remove from the Site, for the duration of the Project, any person making an inappropriate religious, racial, sexual, or ethnic comment, statement, or gesture toward any other individual.
- 4.1.4 The Builder shall immediately remove from the Site, for the duration of the Project, any person who is incompetent, careless, or not working in harmony.
- 4.1.5 The Builder shall be responsible to the Owner for the acts and omissions of its agents and employees, consultants, subcontractors, and suppliers.
- 4.2 **Subcontractor/Supplier Contracts.** The Builder shall enter into written contracts with its subcontractors and suppliers, and those written contracts shall be consistent with this Contract for Construction. It is the intent of the Owner and the Builder that the obligations of the Builder’s subcontractors and suppliers inure to the benefit of the Owner and the Builder, and that the Owner be a third-party beneficiary of the Builder’s agreements with its subcontractors and suppliers.
- 4.2.1 The Builder shall make available to each subcontractor and supplier, prior to the execution of written contracts with any of them, a copy of the pertinent portions of this Contract for Construction, including those portions of the Construction Documents to which the subcontractor or supplier will be bound, and shall require that each subcontractor and supplier shall similarly make copies of applicable parts of such documents available to its respective subcontractors and suppliers.
- 4.2.2 The Builder shall include in its written contracts with its subcontractors and suppliers a provision which contains the acknowledgment and agreement of the subcontractor or supplier that it has received and reviewed the applicable terms, conditions and requirements of this Contract for Construction that are included by reference in its written contract with the Builder, and that it will abide by those terms, conditions, and requirements.

- 4.2.3 The Builder's written contracts with its subcontractors and suppliers shall preserve and protect the rights of the Owner and include the acknowledgment and agreement of each subcontractor or supplier that the Owner is a third-party beneficiary of the contract. The Builder's agreements with its subcontractors and suppliers shall require that in the event of default under, or termination of, this Contract for Construction, and upon request of the Owner, the Builder's subcontractors and suppliers will perform services for the Owner.
- 4.3 **Resolution of Trade Disputes.** The Builder shall promptly resolve claims, complaints, labor disputes and disputes over assignment of work tasks by and among its subcontractors and suppliers.

ARTICLE 5 GOODS, PRODUCTS AND MATERIALS

- 5.1 **Quality of Materials.** The Builder shall furnish goods, products, materials, equipment, and systems which:
- (i) comply with this Contract for Construction;
 - (ii) conform to applicable specifications, descriptions, instructions, drawings, data, and samples;
 - (iii) are new (unless otherwise specified or permitted) and without apparent damage;
 - (iv) are of quality, strength, durability, capacity or appearance equal to or higher than that required by the Construction Documents;
 - (v) are merchantable;
 - (vi) are free from defects; and
 - (vii) are beyond and in addition to those required by manufacturers' or suppliers' specifications where such additional items are required by the Construction Documents.
- 5.2 **Installation and Use of Materials.** All goods, products, materials, equipment and systems named or described in the Construction Documents, and all others furnished as equal thereto shall, unless specifically stated otherwise, be furnished, used, installed, employed and protected in strict compliance with the specifications, recommendations and instructions of the manufacturer or supplier, unless such specifications, recommendations or instructions deviate from accepted construction practices, or the Construction Documents, in which case the Builder shall so inform the Owner and the appropriate Professional and shall proceed as directed by that Professional, unless otherwise directed by the Owner. The Builder shall coordinate and interrelate all trade contracts, and subcontracts to ensure compatibility of goods, products, materials, equipment and systems, and validity of all warranties and guarantees, required by the Construction Documents for the Work.
- 5.3 **Unsuitable Materials.** The Builder shall inform the Owner of goods, products, materials, equipment or systems which the Builder knows or should have known are unsuitable or unavailable at the time of bid submission, and claims relating to or arising out of claims that goods, products, materials, equipment or systems are unsuitable or unavailable shall not be

entertained by the Owner unless the Builder, subcontractor, or supplier notified the Owner in writing at the time of bid submission, along with proposed alternatives. Approval by the Owner and a Professional of substitute goods, products, materials, equipment, or systems does not mean or imply final acceptance by the Owner and Professional if such items should be defective or not as previously represented. Should the Builder furnish any approved goods, products, materials, equipment, or systems different from or in addition to those required by the Construction Documents which require supplemental materials or installation procedures different from or in addition to those required for specified items, the Builder shall provide such at no increased cost to the Owner.

- 5.4 **Security for The Project.** The Builder shall provide security for the Project, including but not limited to security for its Work in progress and for the goods, products, materials, equipment, systems, construction machinery, tools, devices, and other items required, used or to be used for its scope of the Work.

ARTICLE 6 DOCUMENTS AND INFORMATION

- 6.1 **Information from Owner.** The Owner shall provide the Builder with information reasonably necessary to assist the Builder in performing its services including, if applicable:
- (i) the Site legal description and any required survey;
 - (ii) all written and tangible material in its possession concerning conditions below ground at the Site;
 - (iii) if the Project involves an existing structure, all available as-built drawings, record drawings, plans, specifications and structure system information with respect to such structure; and
 - (iv) the Owner's pertinent Project dates and key milestone dates.
- 6.2 **Resolution of Questions.** The Builder shall resolve all questions concerning the Construction Documents with the Professional who has prepared the documents.
- 6.3 **Processing of Documents.** When requested to do so by the Owner, the Builder shall process documents, and provide other reasonably required drawings, services and certifications, necessary to enable the Owner to (i) obtain financing or insurance for the Project; (ii) obtain approvals, permits and Certificates of Occupancy for the Project not otherwise required to be obtained by Builder; and (iii) represent that the Work complies with requirements of governmental agencies having jurisdiction over the Project.
- 6.4 **Sufficiency of Owner Information.** The furnishing of information by the Owner to the Builder shall not relieve the Builder of responsibilities contained elsewhere in this Contract for Construction to evaluate information and documents provided by the Owner and the Builder shall timely notify the Owner in writing of any additional information needed or services required from the Owner in order for the Builder to perform the Work.

ARTICLE 7 SUBMITTALS

- 7.1 **Submittal Schedule.** The Builder shall timely prepare and transmit to the designated Professional a schedule for provision of all anticipated submittals. The schedule shall (i) include submittals required by the specifications; (ii) be in a format acceptable to the Professional; and (iii) set forth specific dates for submission of the listed submittals. The Builder shall review and approve all submittals prior to submission to a Professional.
- 7.2 **Processing of Submittals.** The Builder shall in timely fashion review, approve if appropriate and forward submittals to the Professional(s) for review and approval along with such detail and information as the Professional requires. No part of the Work dealt with by a submittal shall be fabricated or performed until such approval has been given.
- 7.2.1 A Professional is responsible to the Owner, but not to the Builder, to verify that the submittals conform to the design concept and functional requirements of the plans and specifications, that the detailed design portrayed in shop drawings and proposed equipment and materials shown in submittals are of the quality specified and will function properly, and that the submittals comply with the Contract for Construction.
- 7.2.2 All Work shall be performed in accordance with approved submittals. Approval of submittals by a Professional shall not relieve the Builder from complying with this Contract for Construction, including all plans and specifications, except as changed by Change Order.

ARTICLE 8 BUILDER'S INSPECTION AND CORRECTION OF DEFECTIVE OR INCOMPLETE WORK

- 8.1 **Rejection and Correction of Work In Progress.** During the course of Project, the Builder shall inspect and promptly reject any Work (i) which does not conform to the Construction Documents; or (ii) which does not comply with any applicable law, statute, building code, rule or regulation of any governmental, public, and quasi-public authorities and agencies having jurisdiction over the Project.
- 8.1.1 The Builder shall promptly correct or require the correction of all rejected Work, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. The Builder shall bear all costs of correcting such Work, including additional testing and inspections and compensation for all services and expenses necessitated by such correction.
- 8.1.2 The Builder shall bear the cost of correcting destroyed or damaged Work, whether completed or partially completed, of the Owner or other trade contractors or subcontractors caused by the Builder's correction or removal of rejected Work.
- 8.2 **Covered or Concealed Work.** If a portion of the Work has been covered, the Builder shall, if notified to do so by the Owner or a Professional, uncover the designated portion for observation and then replace it.
- 8.2.1 If the designated portion of the Work was covered contrary to the request of the Owner or the Professional, or to requirements specifically expressed in the Construction Documents, the Builder shall receive no additional compensation for

the costs of uncovering and replacement or modification of the Construction Schedule.

- 8.2.2 If the designated portion of the Work was covered prior to a specific request by the Owner or the Professional that it remain uncovered or continuing to the requirements of the Contract Documents, the Builder shall receive additional compensation for the costs of uncovering and replacement or modification of the Construction Schedule(s) only if the designated portion of the Work was in conformance with the Construction Documents.

ARTICLE 9 CHANGE ORDERS AND CHANGES TO THE WORK

- 9.1 **Change Order Requests.** Any party to the construction process may request changes to the Work, compensation, or applicable schedules.
- 9.1.1 With respect to such requests for changes by the Builder, the Builder shall prepare and submit change order requests to the designated Professional.
- 9.1.2 With respect to requests for changes by parties other than the Builder, the Builder shall promptly review and respond to change order requests submitted by a Professional.
- 9.1.3 When requested to do so, the Builder shall prepare and submit to a Professional drawings, specifications, or other data in support of a change order request.
- 9.1.4 Each change order shall include time and monetary impacts of the change, whether the change order is considered alone, or with all other changes during the course of the Project.
- 9.2 **Owner-Directed Changes.** The Owner may unilaterally direct the Builder to implement changes in the Work so long as the Work the Owner is requiring is not outside of the general scope of this Contract for Construction, and the Builder, upon written direction from the Owner, shall proceed with such change.
- 9.3 **Professional-Directed Changes.** The Professional, without the Owner's prior approval, may authorize or direct the Builder to make minor changes in the Work that are consistent with the intent of the Construction Documents and that do not involve a change in Project cost, time for construction, scope, or approved design elements, and the Builder shall promptly carry out such changes. Any such minor changes shall be implemented by written field order and executed by the Builder.
- 9.3A **Construction Change Directives.**
- 9.3A.1 A Construction Change Directive is a writing prepared by the Professional and signed by the Owner and Professional, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. Without invalidating the Contract, the Owner may order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions by way of a Construction Change Directive, the Contract Sum and Contract Time being adjusted accordingly.

- 9.3A.2 A Construction Change Directive shall be used when there is an absence of total agreement on the terms of a Change Order.
- 9.3A.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;
 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 Subparagraph 9.3A6.
- 9.3A.4 Upon receipt of a Construction Change Directive, the Builder shall promptly proceed with the change in the Work involved and advise the Professional of the Builder's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract for Construction Sum or Contract Time.
- 9.3A.5 A Construction Change Directive by the Builder indicates the agreement of the Builder to its terms. Such agreement shall be effective immediately and shall be recorded as a Change Order.
- 9.3A.6 If the Builder does not respond promptly or disagrees with or rejects the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Professional on the basis of reasonable expenditures and savings of those performing the Work related to the change, including, a reasonable allowance for overhead and profit if applicable. The Builder shall keep and present, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Construction Contract Documents, costs for the purposes of this section shall be limited to the following:
1. costs of labor;
 2. costs of materials, supplies and equipment;
 3. rental costs of machinery and equipment;
 4. costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
 5. additional costs of supervision and field office personnel directly attributable to the change.
- 9.3A.7 Pending final determination of cost to the Owner, amounts not in dispute may be included in Applications for Payment. The amount of credit for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Professional. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.
- 9.4 **Administration of Changes.** The Professional will administer and manage all change order requests and change orders and will prepare required drawings, specifications, and other

supporting data as necessary in connection with minor changes, change order requests, change directives, and change orders.

9.5 **Compensation for Changes.** With respect to all change order requests and change directives involving credit to the Owner or additional compensation to the Builder, the Builder shall (i) obtain from subcontractors and suppliers the best possible price quotations; (ii) review such quotations to ascertain whether they are reasonable; (iii) prepare an itemized accounting together with appropriate supporting data, including reasonable expenditures by, and savings to, those performing the Work involved in the proposed change; and (iv) provide a reasonable price quotation to the Professional.

9.5.1 If price quotations for change order requests are determined by the Professional to be unreasonable, the Builder shall, in writing, justify said quotations or provide additional back-up materials. If after review of the additional information the Professional determines the quotation is unreasonable, the Owner may require the subject Work be performed on a time and material basis.

9.5.2 The Builder and its subcontractors and suppliers shall be allowed no additional compensation for any costs, fees or expenses incurred in performing services already required by this Contract for Construction and shall not be entitled to additional reimbursement for home-office, other non-job-site or indirect overhead expenses, or tools necessary for construction.

9.5.3 It is the responsibility of the Builder to review and approve all pricing of additional work required of its subcontractors and suppliers.

9.6 **Performance of Changes.** Upon receipt of a field order or change order or change directive, changes in the Work shall be promptly performed. All changes in the Work shall be performed under applicable conditions of the Construction Documents.

9.7 **Disputes Regarding Changes.**

9.7.1 Regardless if there is a dispute (i) that a change has occurred; (ii) whether a change in the Work will result in adjustment of compensation or applicable schedules; or (iii) as to the amount of any adjustment of compensation or applicable schedules, the change shall be carried out if the Owner so directs. No claim shall be prejudiced by performance of the Work so long as the Owner is notified of the claim in writing prior to performance of the Work which is the subject of the dispute and the party disputing the decision of the Owner recites the reasons for its dispute in the written notice. Failure to notify the Owner in writing shall constitute a waiver of any claim resulting from the change.

9.7.2 In the event a change order request is approved by the Owner in the absence of an agreement as to cost, time, or both, the appropriate Professional will (i) receive and maintain all documentation pertaining thereto; (ii) examine such documentation on the Owner's behalf; (iii) take such other action as may be reasonably necessary or as the Owner may request; and (iv) make a written recommendation to the Owner concerning any appropriate adjustment in the Construction Price or time.

9.8 **Necessity for Signed Writing.** No act, omission or course of dealing shall alter the requirement that change orders shall be in writing and signed by the Owner, and that change orders are the exclusive method for effecting any adjustment to compensation or applicable schedules. The Builder understands and agrees, on behalf of itself and its subcontractors and

suppliers, that neither compensation nor applicable schedules can be changed by implication, oral agreement, or unwritten change order.

ARTICLE 10 FINANCIAL CLAIMS AND LIENS

- 10.1 **Notification Regarding Liens.** The Builder shall immediately notify the Owner and Professional(s), both orally and in writing, of the nature and details of any mechanics' liens, construction liens, builder's trust fund claims, or claims of any type made by anyone against the Owner, the Professional(s), the Builder or any subcontractor or supplier of any of them or against the Project whether or not such claims arise from the Work.
- 10.2 **Discharge of Liens.** The Builder shall take all action necessary to obtain the prompt discharge of any liens or claims filed against the Project. If any lien or claim filed against the Project is not discharged and released by the claimant, the Builder shall, within a reasonable period of time, but in no event more than fourteen calendar days after request and at its own cost, promptly obtain discharge and release of, or indemnity for, such lien or claim by providing or filing, as appropriate, the requisite bond. If the Builder fails to have any such lien or claim discharged and released, or fails to provide or file the requisite bond, the Owner shall have the right to pay all sums necessary to obtain such a discharge and release, and the Builder shall bear all expenses incurred by the Owner in so doing.

ARTICLE 11 OWNER'S CONSULTANT(S), PROFESSIONAL(S) AND CONSTRUCTION ADMINISTRATION

- 11.1 **Owner's Designated Professional Representative.** Unless otherwise directed by the Owner, one designated Professional shall act as the Owner's representative from the effective date of this Contract for Construction until one year from the date of achievement of Substantial Completion.
- 11.1.1 The Professional so designated will be the Owner's design representative during performance of the Work and will consult with and advise the Owner on all design and technical matters.
- 11.1.2 The designated Professional will act as initial interpreter of the requirements of this Contract for Construction and as the Owner's advisor on claims.
- 11.2 **Professional Site Visits.** The Professional shall visit the Site at intervals appropriate to the stage of construction to become fully aware of the progress and quality of the completed Work and to determine if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. On the basis of on-site observations as Professional, the Professional shall keep the Owner informed of progress of the Work and shall guard the Owner against defects and deficiencies in the Work.
- 11.3 **Professional Rejection of Work.** The Professional(s) may in accordance with the Professional's Contract disapprove or reject Work which does not comply with (i) this Contract for Construction including approved shop drawings and other submittals; or (ii)

applicable laws, statutes, building codes, rules or regulations of any governmental, public and quasi-public authorities and agencies having or asserting jurisdiction over the Project.

11.4 Professional Evaluations.

11.4.1 The Professional(s) will review and evaluate the results of all inspections, tests and written reports required by this Contract for Construction and by any governmental entity having or asserting jurisdiction over the Project. The Professional(s) will take appropriate action on test results, including acceptance, rejection, requiring additional testing or corrective work, or such other action deemed appropriate by the Professional(s). The Professional(s) will promptly reject Work which does not conform to and comply with testing requirements.

11.4.2 The Professional(s) may require inspection or testing of any Work in addition to that required by this Contract for Construction or governmental entities having or asserting jurisdiction over the Project when such additional inspections and testing are necessary or advisable, whether or not such Work is then fabricated, installed, or completed. The Professional(s) will take appropriate action on all such special testing and inspection reports, including acceptance, rejection, requiring additional testing or corrective work, or such other action deemed appropriate by the Professional(s).

11.5 Professional Submittal Activities. The Professional(s) will review and approve, reject, or take other appropriate action on submittals such as shop drawings, product data, samples and proposed equal materials or equipment and requested substitutions within not more than fourteen calendar days, and will not approve any submittals unless such submittals conform with (i) the Project design concept; (ii) this Contract for Construction; and (iii) the Owner's budgeted Total Project Construction Cost. A Professional's review of submittals shall not constitute final acceptance of materials or equipment furnished or installed if such materials or equipment should be defective or not as represented by approved submittals or as otherwise required by the Construction Documents. The Builder remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly, and for performance of the Work.

11.6 Professional Interpretations. A Professional will, when requested to do so in writing by the Builder, promptly and so as to cause no unnecessary delay, render written or graphic interpretations and decisions necessary for the proper execution of the Work. A Professional's interpretations and decisions relating to artistic effect shall be final if not inconsistent with this Contract for Construction.

11.7 Professional Change Order Activities. The Professional(s) will consult with and advise the Owner concerning, and will administer and manage, all change order requests and change orders and directives on behalf of the Owner.

11.8 Professional Pay Application Activities. The Professional will review applications for payment, including such accompanying data, information and schedules as the Professional requires, to determine the amounts due to the Builder and shall authorize payment by the Owner to the Builder in writing. After the Work is determined to be finally complete and the Professional determines that the Builder has completed the Work, the Professional will determine whether the Builder is entitled to final payment, and, if so, will so certify to the Owner in writing.

- 11.9 **Professional Relationship to Builder.** The duties, obligations and responsibilities of the Builder under this Contract for Construction shall not be changed, abridged, altered, discharged, released, or satisfied by any duty, obligation, or responsibility of any Professional. The Builder shall not be a third-party beneficiary of any agreement by and between the Owner and any Professional. The duties of the Builder to the Owner shall be independent of, and shall not be diminished by, any duties or obligations of any Professional to the Owner.

ARTICLE 12 INSPECTION, CORRECTION OF WORK AND PROJECT CLOSE OUT

- 12.1 **Substantial Completion.** Substantial Completion of the Work shall be deemed to have occurred on the later of the dates that the Work passes a Substantial Completion inspection, and the required Substantial Completion documentation and items have been produced.
- 12.1.1 When the Builder believes that the Work is substantially complete, it shall notify the Owner and the appropriate Professional that its Work is ready for a Substantial Completion inspection.
- 12.1.2 At or prior to the Substantial Completion inspection, the Builder will prepare and furnish to the Professional a Declaration of Substantial Completion, which at a minimum must:
- (i) contain a blank for entry of the date of Substantial Completion, which date will fix the commencement date of warranties and guaranties and allocate between the Owner and the Builder responsibility for security, utilities, damage to the Work and insurance;
 - (ii) include a list of items to be completed or corrected and state the time within which the listed items will be completed or corrected; and
 - (iii) contain signature lines for the Owner, the Builder and the Professional.
- 12.1.3 Upon receipt of notification from the Builder, the Professional will coordinate with the Owner and the Builder a date for inspection of the Work to determine whether the Work is substantially complete.
- 12.1.4 At inspection(s) to determine whether the Work is substantially complete, the Professional will:
- (i) inspect the Work;
 - (ii) list additional items to be completed or corrected; and
 - (iii) determine, in consultation with the Owner, whether Substantial Completion of the Work has occurred.
- 12.1.5 If the Work is determined not to be substantially complete, the Work shall be prosecuted until the Work is substantially complete and the inspection process shall be repeated at no additional cost to the Owner until the Work is determined to be substantially complete.

- 12.1.6 On or prior to the required date of Substantial Completion, the Builder shall deliver to the appropriate Professional keys, permits, the certificate of occupancy, and other necessary and customary documents and items pre-requisite for the Owner's occupancy and use of the Work for its intended purpose. The Professional will obtain and review Substantial Completion documentation and items and will inform the Builder of any deficiencies.
- 12.1.7 When the Owner, the Builder and the appropriate Professional agree that the Work has passed the Substantial Completion inspection and the Builder has produced the required Substantial Completion documentation and items, they shall each sign the Declaration of Substantial Completion declaring the Work substantially complete and establishing the actual date of Substantial Completion. The Declaration of Substantial Completion shall also include a list of and timeline for the completion of Work needing completion and correction which shall be set no longer than 60 calendar days between Substantial Completion and Final Completion (to reach Final Completion).
- 12.2 **Final Completion.** Final Completion of the Work shall be deemed to have occurred on the later of the dates that the Work passes a Final Completion inspection and that the Builder has produced all required Final Completion close-out documentation and items. Final Completion shall not be deemed to have occurred and no final payment shall be due the Builder or any of its subcontractors or suppliers until the Work has passed the Final Completion inspection and all required Final Completion close-out documentation and items have been produced to the Owner by the Builder.
- 12.2.1 When the Builder believes the Work is finally complete, the Builder shall notify the Owner and the appropriate Professional that the Work is ready for Final Completion inspection.
- 12.2.2 Upon receipt of such notification from the Builder, the Professional will coordinate with the Owner and the Builder a date for inspection of the Work to determine whether the Work is finally complete.
- 12.2.3 At the Final Completion inspection to determine whether the Work is finally complete, the Professional will:
- (i) inspect the Work;
 - (ii) determine whether all items on the list included with the Declaration of Substantial Completion have been satisfactorily completed and corrected;
 - (iii) determine whether the Work complies with (a) this Contract for Construction; (b) applicable laws, statutes, building codes, rules or regulations of all governmental, public and quasi-public authorities and agencies having jurisdiction over the Project; and (c) applicable installation and workmanship standards;
 - (iv) determine whether required inspections and approvals by the official(s) having or asserting jurisdiction over the Project have been satisfactorily completed; and
 - (v) determine, in consultation with the Owner, whether the Work is finally complete.

- 12.2.4 If the Work is not finally complete, the Builder shall continue to prosecute the Work, and the inspection process shall be repeated at no additional cost to the Owner, until the Work is finally complete.
- 12.2.5 On or prior to the date of Final Completion, the Builder shall deliver to the appropriate Professional the following Final Completion close-out documentation and items:
- (i) all operating and instruction manuals not previously produced during commissioning and required maintenance stocks;
 - (ii) two (2) sets of as-built drawings and markups;
 - (iii) certification and affidavit that all insurance required of the Builder beyond final payment, if any, is in effect and will not be canceled or allowed to expire without notice to the Owner;
 - (iv) written consent of the surety(ies), if any, to final payment;
 - (v) full, final and unconditional waivers of mechanics or construction liens, releases of builder's trust fund or similar claims, and release of security interests or encumbrances on the Project property from each contractor, subcontractor, supplier or other person or entity who has, or might have a claim against the Owner or the Owner's property;
 - (vi) full, final and unconditional certification and affidavit that all of the Builder's obligations to contractors, subcontractors, suppliers and other third parties for payment for labor, materials or equipment related to the Project have been paid or otherwise satisfied;
 - (vii) all written warranties and guarantees relating to the labor, goods, products, materials, equipment and systems incorporated into the Work, endorsed, countersigned, and assigned as necessary;
 - (viii) affidavits, releases, bonds, waivers, permits and other documents necessary for final close-out of Work;
 - (ix) a list of any item(s) due but unable to be delivered and the reason for non-delivery; and
 - (x) any other documents reasonably and customarily required or expressly required herein for full and final close-out of the Work.
 - (xi) all documentation evidencing completion of required demonstrations and training.
- 12.2.6 The appropriate Professional will review and determine the sufficiency of all Final Completion close-out documentation and items required for Final Completion which are submitted by the Builder and will immediately inform the Builder about any deficiencies and omissions.

ARTICLE 13
BUILDER'S WARRANTIES AND GUARANTEES

- 13.1 **One-Year Warranty.** In addition to the warranties and guarantees set forth elsewhere in this Contract for Construction, the Builder, upon request by the Owner or the Professional, shall promptly correct all failures or defects in the Work for a period of one year after the actual date of Substantial Completion.
- 13.1.1 The Builder shall schedule, coordinate, and participate in a walk-through inspection of the Work one month prior to the expiration of the one-year correction period, and shall notify the Owner, the appropriate Professional(s), and any necessary subcontractors and suppliers of the date of, and request their participation in, the walk-through inspection. The purpose of the walk-through inspection will be to determine if there are defects or failures which require correction.
- 13.1.2 Should the Builder fail to promptly correct any failure or defect, the Owner may take whatever actions it deems necessary to remedy the failure or defect and the Builder shall promptly reimburse the Owner for any expenses or damages it incurs as a result of the Builder 's failure to correct the failure or defect.
- 13.2 **Express Warranties and Guarantees – Builder.** In addition to the warranties and guarantees set forth elsewhere herein, the Builder expressly warrants and guarantees to the Owner:
- (i) that the Work complies with (a) the Construction Documents; and (b) all applicable laws including by not limited to the American with Disabilities Act, statutes, building codes, rules and regulations of all governmental, public, and quasi-public authorities and agencies having jurisdiction over the Project.
 - (ii) that all goods, products, materials, equipment, and systems incorporated into the Work conform to applicable specifications, descriptions, instructions, drawings, data, and samples and shall be and are (a) new (unless otherwise specified or permitted) and without apparent damage or defect; (b) of quality equal to or higher than that required by the Construction Documents; and (c) merchantable; and
 - (iii) that all management, supervision, labor and services required for the Work shall comply with this Contract for Construction and shall be and are performed in a workmanlike manner.
- 13.3 **Express Warranties and Guarantees – Subcontractors and Suppliers.** The Builder shall require that all of its subcontractors and suppliers provide written warranties, guarantees and other undertakings to the Owner and the Builder in a form identical to the warranties, guarantees and other undertakings set forth in this Contract for Construction, including the warranties, guarantees and undertakings set forth in this Article, which warranties, guarantees and undertakings shall run to the benefit of the Owner as well as the Builder.
- 13.4 **Non-Exclusivity and Survival.** The warranties and guarantees set forth in this Article shall be in addition to all other warranties, express, implied, or statutory, and shall survive the Owner's payment, acceptance, inspection of or failure to inspect the Work, and review of the Construction Documents.
- 13.5 **Non-Limitation.** Nothing contained in Paragraph 13.1, shall be construed to establish a period of limitation with respect to the Builder's obligations under this Contract for Construction. Paragraph 13.1 relates only to the Builder's specific obligations with respect to the Work and has no relationship to the time within which the Builder's contractual obligations under this Contract for Construction may be enforced, nor to the time within

which proceedings may be commenced to establish the Builder's liability with respect to any contractual obligations pursuant to Paragraph 13.1 or contained elsewhere herein.

- 13.6 **Commencement of Obligations.** Unless otherwise specified, all of the Builder's warranty and guaranty obligations, including the time period(s) for all written warranties and guarantees of specifically designated equipment required by the Construction Documents, shall begin on the actual date of Substantial Completion or the date of acceptance by the Owner, whichever is later.
- 13.7 The Contractor for itself and for its Subcontractors, laborers and materialmen and all others directly or indirectly acting for, through or under it or any of them covenants and agrees that no mechanics' liens or claims will be filed or maintained against the Project, the Premises, or any part thereof, or any interest therein or any improvements thereon, or the Owner or against any monies due or to become due from the Owner to the Contractor, for or on account of any work, labor, services, materials, equipment or other items and its Subcontractors, laborers and materialmen and all others above mentioned do hereby expressly waive, release and relinquish all rights to file or maintain such liens and claims and agree further that this waiver of the right to file or maintain mechanics' liens and claims shall be an independent covenant and shall apply as well to work, labor and services performed and materials, equipment and other items furnished under any change order or supplemental agreement for extra or additional work in connection with the Project as to the original Work covered by the Contract Documents. If any Subcontractor, laborer or materialman of the Contractor or any other person directly or indirectly acting for, through or under it or any of them files or maintains a mechanics' lien or claim as aforesaid the Contractor agrees to cause such liens and claims to be satisfied, removed or discharged at its own expense by bond, payment or otherwise within ten (10) days from the date of the filing thereof, and upon its failure so to do, the Owner shall have the right, in addition to all other rights and remedies provided under the Contract Documents or by law, to cause such liens or claims to be satisfied, removed or discharged by whatever means the Owner chooses, at the entire cost and expense of the Contractor (such cost and expense to include reasonable attorney's fees and disbursements). The Contractor agrees to indemnify, protect and save harmless the Owner from and against any and all such liens and claims and actions brought or judgments rendered thereon, and from and against any and all loss, damages, liability, costs and expenses, including reasonable attorney's fees and disbursements, which the Owner may sustain or incur in connection therewith.

ARTICLE 14 OWNER'S DUTIES, OBLIGATIONS AND RESPONSIBILITIES

- 14.1 **Timely Compensation of Builder.** The Owner shall timely compensate the Builder in accordance with this Contract for Construction.
- 14.2 **Payment for Testing.** Unless otherwise required to be provided by the Builder in its scope of services, Owner shall secure and pay for all Project testing.
- 14.3 **Owner Review of Documents.** The Owner shall review documents prepared by the Builder in a timely manner and in accordance with schedule requirements. Review by the Owner shall be solely for the purpose of determining whether such documents are generally

consistent with the Owner's intent. No review of such documents shall relieve the Builder of any of its responsibilities.

- 14.4 **Status of Owner.** The Owner shall not have control or charge of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, nor shall the Builder, for any of the foregoing purposes, be deemed the agent of the Owner.
- 14.5 **Owner's Utilities.** The Owner shall provide water, gas, and electrical energy only as they exist at the Site prior to the start of construction. The Builder shall be responsible to provide and pay for connections to, extensions from and means of using these utilities.
- 14.5.1 The Owner will pay utility company bills for water, gas and electrical energy which is required for the Project and which passes through the Owner's meters. However, the Owner shall not pay for (i) water which is expended without proper regard for ecological and conservation considerations; (ii) electrical energy expended in electric heating devices; or (iii) utilities for Builder's field offices.
- 14.5.2 Acceptance by the Builder of the use of the Owner's water, gas and electrical energy constitutes a release from the Builder to the Owner of all claims and liability for any damages or losses which may be incurred by the Builder as a result of water, gas and electrical energy outages or voltage variations or surges.
- 14.6 **Statements of Owner's Capacity.** The Owner, upon reasonable written request, shall furnish to the Builder in writing statements of the record legal title to the Site on which the Project is located and the Owner's interest therein at the time of execution of this Contract for Construction.

ARTICLE 15 BUILDER'S COMPENSATION

- 15.1 **Unit Prices.** If any portion of the Construction Price is determined by the application of unit prices, the number of units contained in the Builder's Compensation Schedule is an estimate only, and the compensation to the Builder shall be determined by the actual number of units incorporated in, or required by, the Work.
- 15.2 **Schedule of Values.** The Builder shall prepare and present to the Owner and the designated Professional the Builder's schedule of values, apportioning the different elements of the Work for purposes of periodic and final payment. The Builder's schedule of values shall be presented in the format, and with such detail and supporting information, requested by the Professional or Owner. The Builder shall not imbalance or artificially inflate any element of its schedule of values. Upon the Professional and Owner's acceptance, the schedule of values shall be used to process and pay the Builder's payment requests. The schedule of values shall not be changed without written change order authorized by the Owner.
- 15.3 **Invoicing Procedures.** In accordance with the procedures and requirements set forth in this Article, the Builder shall invoice the Owner and the Owner shall pay the Builder the Construction Price for Work performed in accordance with the Contract Documents.
- 15.3.1 The Builder shall submit invoices once a month on or before the 25th day of the month to the Professional requesting payment for labor and services rendered during the

preceding thirty calendar days. Each invoice shall contain such detail and be backed up with whatever supporting information the Owner or a Professional requests and shall at a minimum state:

- (i) the total Construction Price;
 - (ii) the amount due for properly provided labor, materials and equipment properly incorporated into the Project; and with respect to amounts invoiced for materials or equipment necessary for the Project and properly stored at the Site (or elsewhere if offsite storage is approved in writing by the Owner), be accompanied by written proof that the Owner has title to such materials or equipment and that such material and equipment is fully insured against loss or damage;
 - (iii) a breakdown of the various phases or parts of the Work as related to the Construction Price;
 - (iv) the value of the various phases or parts of the Work actually performed;
 - (v) previously invoiced amounts and credit payments made;
 - (vi) the total amount due, less any agreed retainage;
- and shall also have attached such lien waiver and other documentation verifying the Builder's payment to subcontractors and suppliers as the Owner or a Professional may request.

15.4 **Payment Procedures.**

15.4.1 The Professional will review the Builder's applications for payment, including such accompanying data, information and schedules as the Professional requires, to determine the amounts due to the Builder and, based upon such review, together with its inspections of the Work, may authorize payment by the Owner to the Builder in writing. Such authorization will constitute the Professional's certification to the Owner that

- (i) the Work described in the Builder's invoice has progressed to the level indicated and has been performed in accordance with the Contract for Construction;
- (ii) all necessary and appropriate lien waivers have been submitted; and
- (iii) the amount requested is currently due and owing to the Builder.

15.4.2 In the case of unit price work, the Professional's recommendations for payment will constitute a final determination of quantities and classifications of such work.

15.5 **Owner's Right to Refuse Payment/Retainage.** A Professional's approval of the Builder's invoice shall not preclude the Owner from exercising any of its remedies under this Contract for Construction. In the event of a dispute, payment shall be made for amounts not in dispute, subject to any setoffs claimed by the Owner. The Owner shall have the right to refuse to make payment and, if necessary, may demand the return of a portion or all of the amount previously paid to the Builder due to:

- (i) the Builder's failure to perform the Work in compliance with the requirements of this Contract for Construction or any other agreement between the parties;

- (ii) the Builder's failure to correctly and accurately represent the Work performed in a payment request, or otherwise;
- (iii) the Builder's performance of the Work at a rate or in a manner that, in the Owner's opinion, is likely to result in the Project or any portion of the Project being inexcusably delayed;
- (iv) the Builder's failure to use funds previously paid the Builder by the Owner, to pay the Builder's Project-related obligations including, but not limited to, the Builder's subcontractors, materialmen, and suppliers;
- (v) claims made, or likely to be made, against the Owner or its property;
- (vi) loss caused by the Builder or the Builder's subcontractors, or suppliers; or
- (vii) the Builder's failure or refusal to perform any of its obligations to the Owner.

If the Owner chooses to make payments to the Builder, less retainage, it shall do so within a reasonable period of time after receipt of the Payment Application. Payments that are not unreasonably delayed will bear no interest penalties. The terms of this paragraph and the entire Contract Documents are intended to supersede all provisions of the Prompt Pay Act, O.C.G.A. § 13-11-1 through § 13-11-11.

The Owner shall retain a maximum of five percent (5%) of each progress payment as retainage until the construction reaches substantial completion, or such other maximum percentage of retainage as allowed by law. After substantial completion, the owner may retain 200% of the value of each incomplete item until such items are completed.

- 15.6 **Builder's Right to Refuse Performance for Non-Payment.** If the Owner, without cause or basis hereunder, fails to pay the Builder any amounts then due and payable to the Builder, the Builder shall have the right, in addition to all other rights and remedies contained herein, to cease performance of the Work until receipt of proper payment excluding amounts disputed by the Owner, after first providing thirty calendar days written notice to the Owner of its intent to cease work.
- 15.7 **Correction of Past Payments.** All prior payments, whether based on estimates or otherwise, may be corrected and adjusted in any subsequent payment and shall be corrected and adjusted in the final payment. In the event that any invoice contains a defect or impropriety which would prevent timely payment, the Owner shall notify the Builder in writing of such defect or impropriety. Any disputed amounts determined by the Owner to be payable to the Builder shall be due thirty calendar days from the date the dispute is resolved.
- 15.8 **No Interest On Outstanding Amounts Due.** No interest shall accrue on amounts owed by the Owner to the Builder; nor shall interest accrue on retainage which is withheld to assure performance of this Contract for Construction.
- 15.9 **Invoice Warranties and Guarantees.** The Builder expressly warrants and guarantees to the Owner that:
- (i) title to all goods, products, materials, equipment and systems covered by an invoice will pass to the Owner either by incorporation into the Work, or upon receipt of payment by the Builder, whichever occurs first;

- (ii) all goods, products, materials, equipment, and systems covered by an invoice are free and clear of liens, claims, security interests or encumbrances; and
- (iii) no goods, products, materials, equipment, or systems covered by an invoice have been acquired by the Builder, or its subcontractors or suppliers, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Builder, or its subcontractors or suppliers.

Notwithstanding the above, the Builder shall be responsible for 1) Maintenance and protection of Work until final completion and acceptance, including, but not limited to, the storage of materials and equipment, erection of temporary structures and provisions for drainage as necessary to protect Work from injury, damage, or loss. 2) Any injury, damage, or loss to Work resulting from the action of the elements or any other cause, irrespective of fault or negligence, accepting only such injury, damage, or loss as is caused solely by the negligence or willful misconduct of the Owner or the Professional. 3) Protection of its Work and materials and the Work and materials of his Subcontractors from damage or injury from the weather. Any portion of Work suffering injury, damage, or loss for which Contractor is responsible under 1, 2, or 3 above will be considered defective and shall be corrected or replaced without additional cost to Owner.

- 15.10 **Builder's Signature.** The signature of the Builder on any invoice constitutes the Builder's certification to the Owner that (i) the Builder's services listed in the invoice have progressed to the level indicated and have been performed as required by this Contract for Construction; (ii) the Builder has paid its subcontractors and suppliers their proportional share of all previous payments received from the Owner; and (iii) the amount requested is currently due and owing.
- 15.11 **Taxes.** The Builder shall incorporate into the Construction Price, and pay, all sales, consumer, use and similar taxes for goods, products, materials, equipment, and systems incorporated into the Work which were legally required at the time of execution of this Contract for Construction, whether or not yet effective or merely scheduled to go into effect. The Builder shall secure, defend, protect, hold harmless, and indemnify the Owner from and against any and all liability, loss, claims, demands, suits, costs, fees, and expenses (including actual fees and expenses of attorneys, expert witnesses, and other consultants) relating to any taxes assessed or imposed upon, incurred by, or asserted against the Owner by any taxing authority with respect to such taxes. The Builder shall cooperate with and assist the Owner in securing qualified refunds of any sales or use tax paid by the Owner or Builder on goods, products, materials, equipment, or systems. Any refund secured shall be paid to the Owner.
- 15.12 **Compensation of Builder's Subcontractors and Suppliers.** Upon receipt of payment from the Owner, the Builder shall pay each of its subcontractors and suppliers out of the amount received by the Builder on account of such subcontractor's or supplier's portion of the Work, the amount to which each entity is entitled, reflecting percentages actually retained from payments to the Builder on account of such entity's portion of the Work. The Owner shall have no obligation to pay, and shall not be responsible for payments to, the Builder's subcontractors or suppliers. However, the Owner reserves the right, but has no duty, to make payment jointly to the Builder and to any of its subcontractors or suppliers in the event that the Owner becomes aware that the Builder fails to pay or unreasonably withholds payment from one or more of those entities. Such joint check procedure, if employed by the Owner, shall create no rights in favor of any person or entity beyond the right of the named payees

to payment of the check and shall not be deemed to commit the Owner to repeat the procedure in the future.

- 15.13 **Final Payment.** Prior to being entitled to receive final payment, and as a condition precedent thereto, the Builder must achieve Final Completion. The Owner shall, subject to its rights set forth above in this Article, make final payment of all sums due the Builder within a reasonable amount of time of Professional's execution of a final approval for payment.

ARTICLE 16 SCHEDULE REQUIREMENTS

- 16.1 **Construction Schedule.** The Construction Schedule shall include all pertinent dates and periods for timely completion of the Work.

16.1.1 Unless otherwise directed and approved by the Owner, the Builder shall prepare the Construction Schedule as a critical path schedule with separate divisions for each major portion of the Work or operations. The Construction Schedule shall include and properly coordinate dates for performance of all divisions of the Work, including completion of off-Site requirements and tasks, so that the Work can be completed in a timely and orderly fashion consistent with the required dates of Substantial Completion and Final Completion.

16.1.2 The Construction Schedule shall include (i) the required Commencement Date, the required dates of Substantial Completion and Final Completion; (ii) any guideline and milestone dates required by the Owner; (iii) any applicable subcontractor and supplier subschedules; (iv) a submittal schedule which allows sufficient time for review of documents and submittals; (v) the complete sequence of construction by activity, with dates for beginning and completion of each element of construction; and (vi) required decision dates.

16.1.3 By reviewing the Construction Schedule, the Owner and a Professional do not assume any of the Builder's responsibility (i) that the Construction Schedule be coordinated or complete; or (ii) for timely and orderly completion by the required dates of Substantial Completion, Final Completion and any milestone dates required by the Owner.

16.1.4 The Builder shall review, on a weekly basis, the actual status of the Work against the Construction Schedule. The Builder shall discuss the status of the Work weekly with the designated Professional, so that proper overall management may be provided.

16.1.5 The Builder shall periodically and in all instances when the Builder anticipates that performance of the Work will be delayed or in fact has been delayed, but not less frequently than monthly, prepare a revised Construction Schedule and show actual progress of the Work through the revision date, projected completion of each remaining activity, activities modified since previous submittal, major changes in scope, and other identifiable changes. The updated Construction Schedule shall be accompanied by a narrative report which (i) states and explains any modifications of the critical path schedule, including any changes in logic; (ii) defines problem areas and lists areas of anticipated delays; (iii) explains the anticipated impact the problems and delays will have on the schedule and scheduled activities; (iv) reports corrective action taken or proposed; and (v) states how problems anticipated by projections

shown on the schedule will be resolved to avoid delay in delivering the Work by the required dates of Substantial Completion and Final Completion, and other milestone dates required by the Owner, if any.

- 16.2 **Delay in Performance.** If at any time the Builder anticipates that performance of the Work will be delayed or in fact has been delayed, the Builder shall (i) immediately notify the designated Professional of the probable cause of and effect from the delay, and possible alternatives to minimize the delay; and (ii) take all corrective actions reasonably necessary to deliver the Work by the required dates of Substantial Completion and Final Completion, and other milestone dates required by the Owner, if any.
- 16.3 **Modifications to Time for Performance.** The Builder shall determine and promptly notify the Owner and the Professional(s) in writing when it believes adjustments to the required dates of Substantial Completion or Final Completion, or other milestone dates required by the Owner, if any, are necessary, but no such adjustments shall be effective unless approved in writing by the Owner and Professional(s). The Owner shall have the right to require the Builder to accelerate the work, including providing additional forces and working extended schedules in order to maintain the approved Construction Schedule.
- 16.4 **Early Completion.** The Builder may attempt to achieve Substantial Completion before the required date of Substantial Completion. However, such planned early completion shall be for the Builder's sole convenience and shall not create any additional Builder rights or Owner obligations under this Contract for Construction, nor shall it change the required dates of Substantial Completion or Final Completion. The Owner shall not pay the Builder any additional compensation for achievement of Substantial Completion or Final Completion prior to the required dates nor will the Owner owe the Builder any compensation should the Owner cause the Builder not to achieve Substantial Completion earlier than the required date of Substantial Completion or Final Completion earlier than the required date of Final Completion.
- 16.5 **Modification Dates of Substantial Completion Or Final Completion.** The Builder may propose modifications to the required dates of Substantial Completion or Final Completion. The Owner may, but is not required to, accept the Builder's proposal. Modification(s) of the required dates of Substantial Completion or Final Completion shall be accomplished only by duly authorized and accepted change order(s) stating the new date(s) with specificity and reciting that all references in this Contract for Construction to the required dates of Substantial Completion or Final Completion shall thereafter refer to the date(s) as modified, and all rights and obligations, including the Builder's liability for actual damages, delay damages and liquidated damages, shall be determined in relation to the date(s) as modified.
- 16.6 **Document Review.** The Builder shall provide documents to the Owner and Professional(s) for review in accordance with schedule requirements and with sufficient lead time to allow the Owner and Professional(s) reasonable time for review.

ARTICLE 17 LIQUIDATED DAMAGES

- 17.1 **Time of The Essence.** The parties hereto mutually understand and agree that time is of the essence in the performance of this Contract for Construction and that the Owner will incur damages if the Work is not completed on time. The Builder shall at all times carry out its duties and responsibilities as expeditiously as possible and shall begin, perform, and complete its services so that (i) the Work progresses in accordance with the Construction Schedule; (ii) the Work is substantially completed by the required date of Substantial Completion; and (iii) the Work is finally complete by the date of Final Completion.
- 17.2 **Failure to Timely Achieve Completion.** The parties hereto mutually understand and agree that the Owner will sustain substantial monetary and other damages in the event of a failure or delay by the Builder in the completion of the Work. If the Builder inexcusably fails to achieve Substantial Completion by the required date of Substantial Completion as established and previously set forth in this Contract for Construction, the Builder shall pay to the Owner, as liquidated damages for delay and not as a penalty, the daily amount specified in Chapter 1 for each and every day after the required date of Substantial Completion until Substantial Completion. This liquidated damages provision shall apply and remain in full force and effect in the event that the Builder is terminated by Owner for default and shall apply until Substantial Completion has been achieved by any completing builder, including Owner. If the Builder fails to achieve Final Completion by the required date of Final Completion as established and previously set forth in this Contract for Construction, the Builder shall pay to the Owner, as liquidated damages for delay and not as a penalty, TWO HUNDRED (\$200.00) Dollars per calendar day for failure to meet the required date of Substantial Completion and TWO HUNDRED (\$200.00) for failure to meet the required date of Final Completion. These damages shall be calculated cumulatively, so that, by way of example, if substantial completion continues not to be achieved after the date for Final Completion, damages may be assessed for both delay in Substantial Completion and delay in Final Completion for so long as that situation remains.
- 17.3 **Extension of Time for Delay.** If the Builder is delayed at any time in the progress or performance of the Work without any fault or neglect on its own part, and whether caused by the fault or neglect of the Owner or by any act of God or such other cause beyond the control of the Builder, the Builder shall be entitled to a reasonable extension of time only.
- 17.4 **Excusable Delay.** If the Builder is delayed at any time in the progress or performance of the Work by (i) acts or omissions of the Owner or Professional(s); (ii) major changes ordered by the Owner in the scope of Work; (iii) fire; (iv) unusual delays in transportation; (v) adverse unusual weather conditions; (vi) unavoidable casualties; (vii) causes beyond the Builder's control which the Owner agrees in writing are justifiable; or (viii) any other cause which the Owner determines may justify the delay, the Construction Schedule shall be extended for a period equal to the length of such delay, but only if (a) such delay is not in any way caused by default or collusion on the part of the Builder or by any cause which the Builder could reasonably control or circumvent; (b) the Builder would have otherwise been able to timely perform all of its obligations under this Contract for Construction but for such delay; and (c) immediately but not later than seven calendar days after the beginning of any such delay the Builder gives notice of its delay claim to the Owner. The Contract Time will not be extended due to normal inclement weather. The time for performance of this Contract as stated in the Contract documents, includes an allowance for calendar days which, according to historical data obtainable from the National Oceanic and Atmospheric Administration in the latest edition, prior to bid, for the area in which the Project is located, may not be suitable for construction work. For purposes of the contract

schedule, the Contractor agrees that he may expect inclement weather in accordance with the following table of calendar days:

January	22	July	8
February	16	August	6
March	11	September	4
April	7	October	5
May	4	November	9
June	6	December	15

If the Contractor believes that the progress of the Work has been adversely affected by the abnormal inclement weather, he shall submit a written request for extension of time to the Owner. Such a request for extension of Contract Time shall be substantiated by actual records of the weather on the specific days concerned, as recorded at the official weather station nearest to the Project site. Furthermore, unless the Contractor can substantiate to the satisfaction of the Owner that activities affected during these times of abnormal inclement weather were being performed within fourteen calendar days of their scheduled performance on the Contractor's progress schedule, it will not be entitled to an extension of time therefore.

Extensions of time will not be granted for delays caused by normal inclement weather, unsuitable ground conditions, inadequate construction force, or the failure of the Contractor to place orders for equipment or materials sufficiently in advance to ensure delivery when needed.

17.5 Owner's Right to Withhold Payment. When it reasonably believes (i) that Substantial Completion will be inexcusably delayed; or (ii) that the Builder will fail to achieve Final Completion by the date of Final Completion, the Owner shall be entitled, but not required, to withhold from any amounts otherwise due the Builder the daily amount specified for liquidated damages in this Article for each calendar day of the unexcused delay.

17.5.1 If and when the Builder overcomes the delay in timely achieving Substantial Completion or Final Completion, or any part thereof, for which the Owner has withheld payment, the Owner shall promptly release to the Builder those funds withheld, but no longer applicable, as liquidated damages. However, nothing herein will require the Owner to release any funds properly assessed as liquidated damages.

17.5.2 Delay caused by labor disputes, picketing, employee boycotts, or the like which directly or indirectly involves employees of the Builder or its subcontractors and suppliers is not the responsibility of the Owner and will result in time extensions only if agreed to in writing by the Owner at the time such events arise.

ARTICLE 18 CONCEALED AND UNFORESEEN CONDITIONS

- 18.1 **Notification Regarding Unusual Conditions.** If (i) the Builder encounters concealed and unforeseen conditions of an unusual nature which affect the performance of the Work; or (ii) the conditions vary from those indicated by the Construction Documents; and (iii) such conditions are not ordinarily found to exist or differ materially from those generally recognized as inherent in work of the character provided by the Builder, the Builder shall immediately, but in no event later than one calendar day after first observance of the conditions, notify the appropriate Professional(s) and the Owner before conditions are disturbed and give the Professional(s) or the Owner opportunity to observe the condition in its undisturbed state.
- 18.1.1 The conditions will be promptly investigated and, if they differ substantially and cause a material increase or decrease in the Builder's cost of, or time required for, performance of the Work, compensation or time for performance or both will be equitably adjusted in the discretion of the Owner. The Builder shall provide a lump sum price, or a not to exceed price based on a unit of work to be performed, within one calendar day from the date of Owner's/Professional on-site observation. In the event the Owner and the Builder fail to agree as regards to compensation and/or extension of time, applicable law and dispute provisions of Article 25 will be employed.
- 18.1.2 All adjustments in compensation or extensions of time shall be by change order. Change order requests must be made within five calendar days from the date of observation of the changed conditions.
- 18.1.3 The Builder's failure to notify the Professional(s) and Owner as provided in this Article or to perform any Work prior to receiving a signed Change Directive or Order shall constitute a waiver of any claim arising out of or relating to such concealed or unknown condition.

ARTICLE 19 BUILDER'S RECORDS

- 19.1 **Preparation of Records.** The Builder shall, concurrently with performance of its services, prepare substantiating records regarding services rendered and goods furnished.
- 19.2 **Retention of Records.** The Builder shall retain in its records copies of all (i) written communications; (ii) memoranda of verbal communications; (iii) accounting records (including original estimates and estimating work sheets, purchase orders and invoices); (iv) job site notes; (v) daily logs; (vi) reports; (vii) notices; (viii) all subcontract files (including proposals of successful and unsuccessful bidders); (ix) change order files (including documentation covering negotiated settlements); (x) written policies and procedures, (xi) records necessary to evaluate and verify direct and indirect costs (including by way of example overhead allocations, payroll records, time sheets, rental receipts, fixed asset records); and (xii) other documents such as plans, specifications, submittals, correspondence, minutes, memoranda, tape recordings, videos, accounting records, documents reflecting the unit price of construction and other writings or things which document the Project, its design, its cost, and its construction.

- 19.2.1 The Builder shall maintain substantiating records for five years after the date of Final Completion or for any longer period of time as may be required by law or good construction practice. If the Builder receives notification of a dispute or the commencement of litigation regarding the Project within this five-year period, the Builder shall continue to maintain all Project records until final resolution of the dispute or litigation.
- 19.2.2 The Builder shall, upon seven days' request from the Owner, secure from its subcontractors and suppliers copies of (i) written communications; (ii) memoranda of verbal communications; (iii) accounting records (including original estimates and estimating work sheets, purchase orders and invoices); (iv) job site notes; (v) daily logs; (vi) reports; (vii) notices; (viii) all subcontract files (including proposals of successful and unsuccessful bidders); (ix) Change Order files (including documentation covering negotiated settlements); (x) written policies and procedures, (xi) records necessary to evaluate and verify direct and indirect costs (including overhead allocations), and (xii) other documents generated with respect to the Project.
- 19.3 **Access to Records.** Upon the request of the Owner, the Builder shall make its records available during normal business hours to the Owner, its authorized representative(s) or to any state, federal or other regulatory authority. Any such authority, the Owner and its authorized representative(s) shall be entitled to inspect, examine, review, and copy the Builder's records at the copying party's reasonable expense, within adequate workspace at the Builder's facilities. Failure by the Builder to supply substantiating records from itself and its subcontractors and suppliers upon the request of the Owner shall be reason to exclude the related costs from amounts which might otherwise be payable by the Owner pursuant to this Contract for Construction.

ARTICLE 20 PROPRIETARY DOCUMENTS AND CONFIDENTIALITY

- 20.1 **Nature and Use of Information.** All information, documents, and electronic media furnished by the Owner to the Builder (i) belong to the Owner; (ii) are proprietary and confidential; (iii) are furnished solely for use on the Owner's Project; (iv) shall be kept confidential by the Builder; and (v) shall not be used by the Builder on any other project or in connection with any other person or entity, unless disclosure or use thereof in connection with any matter other than services rendered to the Owner hereunder is specifically authorized in writing by the Owner in advance or is required by any applicable law. The Owner hereby grants to the Builder a limited license to use and reproduce applicable portions of the Construction Documents necessary for execution of the Work. All copies made under this license shall bear the statutory copyright notice, if any, shown on the documents.
- 20.2 **Ownership of Information.** All information, documents, and electronic media prepared by or on behalf of the Builder for the Project are the sole property of the Owner free of any retention rights of the Builder. The Builder hereby grants to the Owner an unconditional right to use, for any purpose whatsoever, any information, documents or electronic media

prepared by or on behalf of the Builder for the Project, free of any copyright claims, trade secrets or other proprietary rights with respect to such documents.

- 20.3 **Disclosure of Information.** The Builder shall not disclose any information it receives from the Owner to any other person or entity except to the extent necessary to allow it to perform its duties under this Contract for Construction.
- 20.4 **Instructions to Employees.** Because it is difficult to separate proprietary and confidential information from that which is not, the Builder shall instruct its employees and agents to regard all information which is not in the public domain as information which is proprietary and confidential.
- 20.5 **Non-Publication.** Submission or distribution of documents to meet official regulatory requirements or for other required purposes in connection with the Project is not to be construed as publication in derogation of the Owner's common law copyrights or other reserved rights.

ARTICLE 21 GENERAL INSURANCE REQUIREMENTS

- 21.1 **General Insurance Requirements.** Unless otherwise required, each insurance policy:
- (i) shall be issued by an insurance carrier acceptable to the Owner;
 - (ii) shall be kept in force throughout performance of the Builder's services and for one year after the end of such performance;
 - (iii) shall be an occurrence policy; and
 - (iv) shall be evidenced by a certificate of insurance acceptable to the Owner which provides that the coverage evidenced thereby shall not be substantially modified or canceled without thirty calendar days' prior written notice to the Owner.
- 21.2 **Certificates of Insurance.** Prior to performance of services on the Project, the Builder shall (i) have all required insurance coverage in effect; and (ii) deliver to the Owner certificates of insurance for all its required minimum insurance coverage. The Builder shall (i) require that its subcontractors, and suppliers have similar coverage in effect, and prior to the performance of any services on the Project by the Builder's subcontractors and suppliers, and (ii) shall ensure that all required insurance coverages of its subcontractors and suppliers are in effect. The Owner shall have no responsibility to verify compliance by the Builder or its subcontractors and suppliers. Upon the request of the Owner, the Builder shall deliver to the Owner certificates of insurance and/or copies of policies for all required insurance coverage.
- 21.3 **Effect of Insurance.** Compliance with insurance requirements shall not relieve the Builder of any responsibility to indemnify the Owner for any liability to the Owner as specified in any other provision of this Contract for Construction, and the Owner shall be entitled to pursue any remedy in law or equity if the Builder fails to comply with the contractual provisions of this Contract for Construction. Indemnity obligations specified elsewhere in this Contract for Construction shall not be negated or reduced by virtue of any insurance carrier's (i) denial of insurance coverage for the occurrence or event which is the subject matter of the claim; or (ii) refusal to defend any named insured.

- 21.4 **Waiver of Subrogation.** The Builder hereby releases and discharges the Owner and the Owner's Related Parties of and from all liability to the Builder, and to anyone claiming by, through or under the Builder, by subrogation or otherwise, on account of any loss or damage to tools, machinery, equipment, or other property, however caused.

ARTICLE 22 GENERAL BOND REQUIREMENTS

- 22.1 **General Bond Requirements.** The Builder shall be required to provide separate performance and payment bond(s), the penal sum of each bond to be in an amount not less than the Construction Price, as adjusted by any change order(s), and each bond shall:
- (i) be in a form approved by the Owner;
 - (ii) incorporate by reference the terms of this Contract for Construction;
 - (iii) be issued by a surety reasonably acceptable to the Owner that shall be on the Department of Treasury Listing of Acceptable Sureties and Underwriting Limitations, having a Best Rating of A:VII or better;
 - (iv) be accompanied by a power of attorney certifying that the person(s) executing the bond have the authority to do so.
- 22.2 **Delivery of Bonds.** The Builder shall deliver any required bond(s) and power(s) of attorney to the Owner within 10 calendar days after receipt of Notice of Award.

ARTICLE 23 OWNER'S RIGHT TO STOP WORK

- 23.1 **Cease and Desist Order.** If the Builder fails to correct Work which is not in accordance with the requirements of the Contract Documents, or persistently fails to carry out Work in accordance with the Contract Documents, or there are actual or potential third-party claims, or there is failure to make timely payments for labor or materials, damage to other entities connected with the Project, or reasonable evidence that the Contract cannot be completed for the Contract Price, or the Builder fails to supply labor or materials in accordance with the Contract Documents, the Owner, by written order signed personally or by the Professional, may order the Builder to stop the Work, or any portion thereof, until the cause for such order has been eliminated.
- 23.1.1 The Builder shall not be entitled to an adjustment in the time for performance or the Construction Price under this clause since such stoppages are considered to be the fault of the Builder.
- 23.1.2 The right of the Owner to stop Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Builder or others.

- 23.1.3 In the event the Owner issues instructions to cease and desist, and in the further event that the Builder fails and refuses within seven calendar days to provide adequate assurance to the Owner that the cause of such instructions will be eliminated or corrected, then the Owner shall have the right, but not the obligation, to carry out the Work or any portion of the Work with its own forces, or with the forces of another builder, and the Builder shall be responsible for the cost of performing such Work by the Owner.
- 23.1.4 The rights set forth herein are in addition to, and without prejudice to, any other rights or remedies the Owner may have against the Builder.

ARTICLE 24

TERMINATION OR SUSPENSION OF CONTRACT FOR CONSTRUCTION

24.1 Termination for Cause By Owner.

- 24.1.1 The Owner may terminate this Contract for Construction for cause if the Builder materially breaches this Contract for Construction by:
- (i) refusing, failing or being unable to properly manage or perform on any requirement of the Project;
 - (ii) refusing, failing or being unable to supply the Project with sufficient numbers of workers, properly skilled workers, proper materials, or maintain applicable schedules;
 - (iii) refusing, failing or being unable to make prompt payment to subcontractors or suppliers;
 - (iv) disregarding laws, ordinances, rules, regulations or orders of any public authority or quasi-public authority having jurisdiction over the Project;
 - (v) refusing, failing or being unable to substantially perform in accordance with the terms of the Contract for Construction as determined by the Owner, or as otherwise defined elsewhere herein, or
 - (vi) refusing, failing or being unable to substantially perform in accordance with the terms of any other agreement between the Owner and Builder.
- 24.1.2 Upon the occurrence of any of the events described in Paragraph 24.1.1, the Owner may give written notice to the Builder setting forth the nature of the default and requesting cure within seven calendar days from the date of notice. At any time thereafter, if the Builder fails to initiate the cure or if the Builder fails to expeditiously continue such cure until complete, the Owner may give written notice to the Builder of immediate termination, and the Owner, without prejudice to any other rights or remedies, may take any or all of the following actions:
- (i) complete all or any part of the Work, including supplying workers, material and equipment which the Owner deems expedient to complete the Work;
 - (ii) contract with others to complete all or any part of the Work, including supplying workers, material and equipment which the Owner deems expedient to complete the Work;

- (iii) take such other action as is necessary to correct such failure;
- (vi) take possession of all materials, tools, construction equipment and machinery on the Site owned or leased by the Builder;
- (v) directly pay the Builder's subcontractors and suppliers compensation due to them from the Builder;
- (vi) finish the Work by whatever method the Owner may deem expedient; and
- (vii) require the Builder to assign the Builder's right, title and interest in any or all of Builder's subcontracts or orders to the Owner.

24.1.3 If the Owner terminates the Contract for Construction for cause, and the Owner takes possession of all materials, tools, construction equipment and machinery on the Site owned or leased by the Builder, the Builder's compensation shall be increased by fair payment, either by purchase or rental at the election of the Owner, for any materials, tools, construction equipment and machinery items retained, subject to the Owner's right to recover from the Builder the Owner's damages resulting from the termination.

24.1.4 If the Owner terminates this Contract for Construction for cause, and it is subsequently determined by a court of competent jurisdiction that such termination was without cause, then in such event, said termination shall be deemed a termination for convenience as set forth in Paragraph 24.3.

24.2 **Termination for Cause By Builder.**

24.2.1 The Builder may terminate this Contract for Construction for cause if the Owner materially breaches this Contract for Construction by:

- (i) refusing, failing or being unable to make prompt payment to the Builder without cause;
- (ii) disregarding laws, ordinances, rules, regulations or orders of any public authority or quasi-public authority having jurisdiction over any Project; or refusing, failing or being unable to substantially perform in accordance with the terms of this Contract for Construction or any other agreement between the Owner and the Builder.

24.2.2 Upon the occurrence of any of the events described in Paragraph 24.2.1, the Builder may give written notice to the Owner setting forth the nature of the default and requesting cure within thirty calendar days from the date of notice. If the Owner fails to cure the default within seven calendar days, the Builder, without prejudice to any rights or remedies, may give written notice to the Owner of immediate termination.

24.3 **Termination Or Suspension for Convenience.** The Owner may at any time give written notice to the Builder terminating this Contract for Construction or suspending the Project, in whole or in part, for the Owner's convenience and without cause. If the Owner suspends the Project for convenience, the Builder shall immediately reduce its staff, services, and outstanding commitments in order to minimize the cost of suspension.

24.4 **Builder's Compensation When Builder Terminates for Cause Or Owner Terminates for Convenience.** If this Contract for Construction is (i) terminated by the Builder pursuant to Paragraph 24.2; (ii) terminated by the Owner pursuant to Paragraph 24.3; or (iii) suspended more than three months by the Owner pursuant to Paragraph 24.3, the Owner shall

Reimburse the Builder for, an equitable portion of the Builder's fee based on the portion of the Work completed, excluding any allowance for overhead or profit, prior to the effective date of termination.

- 24.5 **Builder's Compensation When Owner Terminates for Cause.** If this Contract for Construction is terminated by the Owner for cause pursuant to Paragraph 24.1, no further payment shall be made to the Builder until Final Completion of the Project. At such time, the Builder shall be paid the remainder of the Construction Price less all costs and damages incurred by the Owner as a result of the default of the Builder, including liquidated damages applicable thereto. The Builder shall additionally reimburse the Owner for any additional costs or expenses incurred.
- 24.6 **Limitation On Termination Compensation.** Regardless of the reason for termination or the party terminating, the total sum paid to the Builder shall not exceed the Contract Construction Price (and any payment for line items appearing in the Schedule of Values shall be limited to the scheduled amount), as properly adjusted, reduced by the amount of payments previously made and penalties or deductions incurred pursuant to any other provision of this Contract for Construction, and shall in no event include duplication of payment.
- 24.7 **Builder's Responsibility Upon Termination.** Irrespective of the reason for termination or the party terminating, if this Contract for Construction is terminated, the Builder shall, unless notified otherwise by the Owner,
- (i) immediately stop work;
 - (ii) terminate outstanding orders and subcontracts;
 - (iii) settle the liabilities and claims arising out of the termination of subcontracts and orders; and
 - (iv) transfer title and deliver to the Owner such completed or partially completed Work, and, if paid for by the Owner, materials, equipment, parts, fixtures, information, and such contract rights as the Builder has.
- 24.8 **Lack of Duty to Terminate.** The right to terminate or suspend the Work shall not give rise to a duty on the part of either the Owner or the Builder to exercise that right for the benefit of the Owner, the Builder or any other persons or entities.
- 24.9 **Limitation on Termination Claim.** If the Builder fails to file a claim within 90 calendar days from the effective date of termination, the Owner shall pay the Builder only for services actually performed and expenses actually incurred prior to the effective termination date.

ARTICLE 25 APPLICABLE LAW AND DISPUTE RESOLUTION

- 25.1 **Applicable State Law.** This Contract for Construction shall be deemed to be entered into in and shall be interpreted under the laws of the state in which the Project is located.
- 25.2 **Court Actions.** Except as expressly prohibited by law:
- (i) all legal actions hereunder shall be conducted only in the Superior Court of Cobb County; except that any final judgment may be enforced in other jurisdictions in any manner provided by law;

- (ii) the choice of jurisdiction and venue described in the preceding paragraph shall be mandatory and not permissive in nature, thereby precluding the possibility of litigation or trial in any jurisdiction or venue other than that specified herein;
 - (iii) the parties waive any right to assert the doctrine of forum *non conveniens* or to object to venue; and
 - (iv) the parties waive any right to a jury trial, and agree that all legal actions shall be tried, both as to factual and legal issues, only to the Court.
- 25.3 **Mutual Discussion.** In case of any dispute, claim, question, or disagreement arising from or relating to the Project or arising out of this Contract for Construction or the breach thereof, the parties shall first attempt resolution through mutual discussion.
- 25.4 **Facilitative Mediation.** If the parties cannot resolve any dispute, claim, question, or disagreement arising from or relating to the Project or arising out of this Contract for Construction or the breach thereof through mutual discussion, as a condition precedent to any litigation, the parties shall in good faith participate in private, non-binding facilitative mediation seeking a just and equitable solution satisfactory to all parties.
- 25.4.1 The parties shall not be required to mediate for a period greater than ninety-one calendar days unless otherwise agreed to in writing by the parties. The parties shall share equally any administrative costs and fees of such proceedings, but shall each be responsible for their own expenses otherwise incurred.
- 25.4.2 In the event that the statute of limitations would run during the required mediation period, either party may institute litigation so as to avoid the running of such statute upon the condition that such party immediately seek a stay of such litigation pending the conclusion of the mediation period.
- 25.4.3 During the course of mediation, any party to the mediation may apply for injunctive relief from any court of competent jurisdiction until the mediation period expires or the dispute is otherwise resolved.
- 25.4.4 The Owner, the Professional(s), the Builder, and any other parties involved in any way in the design or construction of the Project are bound, each to each other, by this requirement to mediate prior to commencement of any litigation, provided that they have signed this Contract for Construction or an agreement that incorporates this Contract for Construction by reference or signed any other agreement which binds them to mediate. Each such party agrees that it may be joined as an additional party to a mediation involving other parties under any such agreement. In the case where more than one mediation is begun under any such agreement and any party contends that the mediations are substantially related, the mediations may be conducted by the mediator selected in the first mediation which was commenced at Owner's option.
- 25.5 **Conflicting Dispute Resolution Provisions.** Neither party to this Contract for Construction shall enter into any contract with regard to the Project which directly or indirectly gives the right to resolve any dispute with, involving, or affecting the other to any other person or legal entity which is in conflict with the dispute resolution procedures required by this Article.
- 25.6 **Arbitration Preclusion.** In case of a dispute relating to the Project, or arising out of this Contract for Construction, no party to this Contract for Construction shall be required to participate in or be bound by, any arbitration proceedings.

- 25.7 **Performance During Dispute Resolution.** The Owner and the Builder agree that pending the resolution of any dispute, controversy, or question, the Owner and the Builder shall each continue to perform their respective obligations without interruption or delay, and the Builder shall not stop or delay the performance of the Work. Notwithstanding the above, the Owner shall not be required to make any payments to the Builder that Owner contends are in dispute.

ARTICLE 26 DAMAGES AND REMEDIES

- 26.1 **Builder's Repair.** The Builder shall, at its expense, promptly correct, repair, or replace all goods, products, materials, systems, labor, and services that do not comply with the warranties and guarantees set forth in this Contract for Construction, or any other applicable warranty or guarantee.
- 26.2 **Builder's Reimbursement.** The Builder shall promptly reimburse the Owner for any expenses or damages incurred by the Owner as a result of (i) the Builder's failure to substantially perform in accordance with the terms of this Contract for Construction; (ii) deficiencies or conflicts in the Construction Documents attributable to the Builder or of which the Builder was or should have been aware; (iii) breach of the warranties and guarantees set forth in this Contract for Construction or any other applicable warranty or guarantee; or (iv) other acts or omissions of the Builder.
- 26.3 **General Indemnity.** To the fullest extent permitted by law, the Builder shall indemnify and hold harmless Owner, its elected and appointed officials, its commissioners, its officers, agents, employees, representatives, consultants, servants, volunteers, and County's Engineer, agents, employees, successors, and assigns (individually an "Indemnified Party" and collectively the "Indemnified Parties" or "Owner's Related Parties") from and against any and all liabilities, damages, suits, claims, costs, including but not limited to attorneys' fees and other legal expenses, liens and judgments, or damages of any nature, including claims for contribution and/or indemnification, for injuries to or death of any person or persons, or damage to the property or other rights of any person or persons arising out of or resulting from the performance or non-performance of the work. The Builder's duty to indemnify shall extend to all claims, damage, loss, or expense caused in whole or in part by any act or omission of the Builder, any subcontractor, or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder, provided however that the duty to indemnify hereunder shall not extend to any claim, damage, loss, or expense which results solely from the negligence of a party indemnified hereunder. The Builder's duty to indemnify in connection with the performance or non-performance of its work as outlined and defined in this clause shall also extend to property owners on whose respective properties the Builder undertakes construction as specified in the Contract Documents. The Builder's duty to indemnify any such property owner shall terminate at such time as the Builder completes construction on or adjacent to the property owner's respective property involved in the subject project. These indemnities shall not be limited by reason of the listing of any insurance coverage.
- 26.3.1 To the fullest extent permitted by law, the Builder, for itself and for its subcontractors and suppliers, and the respective agents, employees and servants of each, expressly

waives any and all immunity or damage limitation provisions available to any agent, employee or servant under any workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts, to the extent such statutory or case law would otherwise limit the amount recoverable by the Owner or the Owner's Related Parties pursuant to the indemnification provision contained in the paragraph above.

26.3.2 These obligations to indemnify the Indemnified Party(ies) shall survive the expiration or termination of this Agreement.

- 26.4 **Intellectual Property Indemnity.** To the fullest extent permitted by law, the Builder shall defend, protect, hold harmless, and indemnify the Owner and the Owner's Related Parties from and against any and all liability, loss, claims, demands, suits, costs, fees and expenses (including actual fees and expenses of attorneys, expert witnesses, and other consultants), by whomsoever brought or alleged, for infringement of patent rights, copyrights, or other intellectual property rights, except with respect to designs, processes or products of a particular manufacturer expressly required by the Owner or Professional(s) in writing. If the Builder has reason to believe the use of a required design, process or product is an infringement of a patent, the Builder shall be responsible for such loss unless such information is promptly given to the Owner.
- 26.5 **Non-Exclusivity of Owner's Remedies.** The Owner's selection of one or more remedies for breach of this Contract for Construction contained herein shall not limit the Owner's right to invoke any other remedy available to the Owner under this Contract for Construction or by law.
- 26.6 **Waiver of Damages.** The Builder shall not be entitled to, under any circumstance, and hereby waives any monetary claims for or damages arising from or related to, lost profits, lost business opportunities, unabsorbed overhead, or any indirect consequential damages.

ARTICLE 27 MISCELLANEOUS PROVISIONS

- 27.1 **Integration.** This Contract for Construction represents the entire and integrated agreement between the Owner and the Builder, and supersedes all prior negotiations, representations, or agreements, either written or oral, for the Project. This Contract for Construction may be amended only by written instruments signed by both the Owner and the Builder and is subject to such reasonable modifications as may be required by the Owner's lender(s) or insurer(s), if any.
- 27.2 **Severability.** If any provision of this Contract for Construction, or the application thereof, is determined to be invalid or unenforceable, the remainder of that provision and all other provisions shall remain valid and enforceable.
- 27.3 **Waiver.** No provision of this Contract for Construction may be waived except by written agreement of the parties. A waiver of any provision on one occasion shall not be deemed a waiver of that provision on any subsequent occasion, unless specifically stated in writing. A waiver of any provision shall not affect or alter the remaining provisions of this Contract for Construction.

- 27.4 **Strict Compliance.** No failure of the Owner to insist upon strict compliance by the Builder with any provision of this Contract for Construction shall operate to release, discharge, modify, change, or affect any of the Builder's obligations.
- 27.5 **Third-Party Beneficiaries.** This Contract for Construction shall inure solely to the benefit of the parties hereto and their successors and assigns, and, except as otherwise specifically provided in this Contract for Construction, nothing contained in this Contract for Construction is intended to or shall create a contractual relationship with, or any rights or cause of action in favor of, any third party against either the Owner or the Builder.
- 27.6 **Survival.** All provisions of this Contract for Construction that contain continuing obligations shall survive its expiration or termination.
- 27.7 **Assignment.** Except as prohibited by applicable law, neither party shall assign any or all of its benefits or executory obligations under this Contract for Construction without the approval of the other party, except in case of assignment solely for security or assignment by the Owner to a Related Party of the Owner, or except as otherwise specifically provided for in this Contract for Construction in case of default. The Owner and the Builder bind their successors and assigns to the other party to this Contract for Construction.
- 27.8 **Execution of Documents.** Upon the request of the Owner, the Builder shall execute documents required by the Owner's lender whereby the Builder agrees that in the event of the Owner's default under, or the termination of, any construction loan agreement, the Builder will complete the services required by this Contract for Construction under the terms and conditions contained herein so long as the lender fulfills the obligations of the Owner toward the Builder as set forth in this Contract for Construction.
- 27.9 **Separate Contracts.** Separate contracts may be awarded for, but not necessarily limited to, telephone cabling, computer cabling, furniture and equipment, landscaping, signage, and graphics.

ARTICLE 28 SPECIAL TERMS AND CONDITIONS

- 28.1 Should these General Terms and Conditions be in conflict with any attached Special Terms and Conditions, the Special Terms and Conditions will control.

ARTICLE 29 EVIDENCE OF COMPLIANCE WITH GEORGIA SECURITY & IMMIGRATION COMPLIANCE ACT

- 29.1 The Owner and Contractor agree that compliance with the requirements of O.C.G.A. § 13-10-91 and Rule 300-10-1-.02 of the Rules of the Georgia Department of Labor and are conditions of this Agreement for the physical performance of services.
- 29.2 Reserved.

- 29.3 The Contractor further agrees that its compliance with the requirements of O.C.G.A. § 13-10-91 and DOL Rule 300-10-1-.02 is attested to on the executed Contractor Affidavit and Agreement attached hereto as EXHIBIT A.
- 29.4 If employing or contracting with any subcontractor(s) in connection with this Agreement, Contractor further agrees:
- 29.4.1 To secure from the subcontractor(s) such subcontractor(s)' indication of the employee-number category applicable to the subcontractor(s); and
- 29.4.2 To secure from the subcontractor(s) an affidavit attesting to the subcontractor's compliance with O.C.G.A. § 13-10-91 and DOL Rule 300-10-1-.02; such affidavit being in the form attached hereto and referenced as EXHIBIT A-1; and
- 29.4.3 To submit such subcontractor affidavit(s) to the Owner when the subcontractor(s) is retained, but in any event, prior to the commencement of work by the subcontractor(s).
- 29.5 The failure of Contractor to supply the affidavit of compliance at the time of execution of this Agreement and/or the failure of Contractor to continue to satisfy the obligations of O.C.G.A. Sec. 13-10-91 and DOL Rule 300-10-1-.02 as set forth in this Agreement during the term of the Agreement shall constitute a material breach of the contract. Upon notice of such breach, Contractor shall be entitled to cure the breach within ten (10) days, upon providing satisfactory evidence of compliance with the terms of this Agreement and State law. Should the breach not be cured, the Owner shall be entitled to all available remedies, including termination of the contract and damages.

ARTICLE 30 DEFINITIONS

When one of the following capitalized words, terms or phrases is used in this contract, it shall be interpreted or construed first as defined below, second according to its generally accepted meaning in the construction industry, and third according to its common and customary usage.

Builder: An entity, including but not limited to a general contractor, a trade contractor, or a construction manager, engaged directly by the Owner pursuant to a Contract for Construction.

Construction Price: The dollar amount for which a Builder agrees to perform the Work set forth in a Contract for Construction.

Construction Documents: Plans, specifications, change orders, revisions, addenda, and other information which set forth in detail the Work.

Construction Schedule: The timetable which sets forth pertinent dates for timely completion of the Work.

Contract for Construction: A written agreement between the Owner and a Builder for provision of goods, products, materials, equipment, systems, management, supervision, labor, and services required to construct all or part of a Project.

Contract for Professional Services: A written agreement between the Owner and a Professional for provision of services and related items required to design or engineer all or part of a Project.

Declaration of Substantial Completion: Document declaring the Work substantially complete and suitable for occupancy or beneficial use by the Owner.

Final Completion: The stage of construction when the Work has been completed in accordance with the Contract for Construction and the Owner has received all documents and items necessary for closeout of the Work.

Hazardous Substances: The term "Hazardous Substance" shall have the same meaning and definition as set forth in the Comprehensive Environmental Response Compensation and Liability Act as amended, 42 U.S.C. § 6901 *et seq*, and regulations promulgated thereunder (collectively "CERCLA") and any corresponding state or local law or regulation, and shall also include: (a) any Pollutant or Contaminant as those terms are defined in CERCLA; (b) any Solid Waste or Hazardous Constituent as those terms are defined by, or are otherwise identified by, the Resource Conservation and Recovery Act as amended, 42 U.S.C. § 6901 *et seq*, and regulations promulgated thereunder (collectively "RCRA") and any corresponding state or local law or regulation; (c) crude oil, petroleum and fractions of distillates thereof; (d) any other material, substance or chemical defined, characterized or regulated as toxic or hazardous under any applicable law, regulation, ordinance, directive or ruling; and (e) any infectious or medical waste as defined by any applicable federal or state laws or regulations.

Owner's Related Parties: Any elected officials, agents, officers, trustees, office holders, directors, and employees of each.

Professional: An entity, including but not limited to an architect, civil engineer or geotechnical engineer, engaged directly by the Owner to provide design or engineering services.

Project: A planned construction undertaking as more specifically described immediately preceding the recitals in Chapter 1 of a Contract for Professional Services or in a Contract for Construction.

Project Design Schedule: The timetable which sets forth the required relationships between, and pertinent dates for, required completion of design and engineering services, documents, and related activities.

Site: The geographical location of a Project, usually defined by legal boundary lines, and the location characteristics including, but not limited to, grades and lines of streets, alleys, pavements and adjoining structures, rights-of-way, restrictions, easements, encroachments, zoning, deed restrictions, existing buildings and improvements, and service and utility lines.

Substantial Completion: The stage of construction when the Owner can occupy or beneficially use satisfactorily completed Work for its intended purpose.

Total Project Construction Cost: The total cost to the Owner to complete construction of the Project, including, without limitation, the Work, the cost of utilities, the cost of fees for permits and licenses, and modifications necessitated by local conditions.

Work: Any and all computers, construction machinery, documents, equipment, facilities, fixtures, furnishings, goods, heat, items, labor, licenses, management, materials, permits, products, services, supervision, supplies, systems, taxes, testing, tools, utilities, transportation, vehicles, and water, required to be performed or supplied and/or necessary for proper execution and completion of the Project, or some portion thereof, whether or not incorporated or to be incorporated into the Project; provided, however, that Work does not include performance of pre-construction services by a Construction Manager.

**ARTICLE 31
CONFLICT OF INTEREST AFFIDAVIT**

Contractor agrees, and shall execute an affidavit in the form as attached hereto as Exhibit B attesting that, to the best of its knowledge no circumstances exist that will cause a conflict of interest in performing services for Owner, that no employee of Owner, nor any public agency official or employee affected by this Contract has any pecuniary interest in the business of this firm, associates or consultants of this firm, or the firm's parent firm, subsidiary, or other legal entity of which this firm is a part, and that no person associated with or employed by this firm has any interest that would conflict in any way, manner or degree with the performance of services for Owner.

**ARTICLE 32
NON-COLLUSION OATH**

Owner and Contractor acknowledge that the Georgia statute concerning public works construction contracting requires that any person who procures such work by bidding or proposal shall make an oath in writing that he/she has not prevented or attempted to prevent competition in such bidding. O.C.G.A. § 36-91-21(d) and (e). In compliance with O.C.G.A. § 36-91-21(d) and (e), Contractor shall make the oath in the form as attached hereto as Exhibit C. If such oath is false, this Contract shall be void, and all sums paid by the Owner on the Contract may be recovered by appropriate action.

**CONTRACTOR AFFIDAVIT & AGREEMENT
(EXHIBIT A)**

This affidavit must be signed, notarized and submitted with any bid requiring the performance of physical services. If the affidavit is not submitted at the time of the bid, the bid will be determined non-responsive and will be disqualified.

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is contracting with Cobb County, Georgia, has registered with, is authorized to use, and is participating in a federal work authorization program (an electronic verification of work authorization program operated by the U.S. Department of Homeland Security or any equivalent federal work authorization program operated by the U.S. Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA)). The undersigned contractor further attests that it will continue to use the federal Employment Eligibility Verification (EEV) work authorization program throughout the contract period.

The undersigned further agrees that should it employ or contract with any subcontractor(s) or should its subcontractor(s) employ other subcontractor(s) for the physical performance of services pursuant to the contract with Cobb County, Georgia, the contractor or subcontractor will:

- (1) Notify the County within five business days of entering into a contract or agreement for hire with any subcontractor(s);
- (2) Secure from any subcontractor(s) and/or their subcontractor(s) verification of compliance with O.C.G.A. § 13-10-91 on the attached Subcontractor Affidavit (EXHIBIT A-1) prior to the commencement of any work under the contract/agreement;
- (3) Secure from any subcontractor(s) and/or their subcontractor(s) a completed Immigration Compliance Certification (EXHIBIT A-2) prior to the commencement of any work under the contract/agreement;
- (4) Provide the subcontractor(s) with legal notice that Cobb County, Georgia, reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the affidavit and/or for failure to comply with the requirements referenced in the affidavit;
- (5) Maintain records of such compliance and provide a copy of each such verification to Cobb County, Georgia, at the time the subcontractor(s) is retained to perform such services or upon any request from Cobb County, Georgia; and
- (6) Maintain such records for a period of five (5) years.

EEV (E-Verify) Program User ID Number

EEV Program Date of Authorization

BY: Authorized Officer or Agent
[Contractor Name]

Contractor Business Name

Printed Name

Date

SWORN AND SUBSCRIBED BEFORE ME

ON THIS THE ____ DAY OF _____, 201_

Notary Public Commission Expires: _____

Version 9/20/13

**SUBCONTRACTOR AFFIDAVIT & AGREEMENT
(EXHIBIT A-1)**

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13- 10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of Cobb County, Georgia, has registered with, is authorized to use, and is participating in a federal work authorization program (an electronic verification of work authorization program operated by the U.S. Department of Homeland Security or any equivalent federal work authorization program operated by the U.S. Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA)). The undersigned contractor further attests that it will continue to use the federal Employment Eligibility Verification (EEV) work authorization program throughout the contract period.

The undersigned further agrees that should it employ or contract with any subcontractor(s) or should its subcontractor(s) employ other subcontractor(s) for the physical performance of services pursuant to the contract with Cobb County, Georgia, the undersigned subcontractor will:

- (1) Notify the County within five business days of entering into a contract or agreement for hire with any subcontractor(s);
- (2) Secure from any subcontractor(s) and/or their subcontractor(s) verification of compliance with O.C.G.A. § 13-10-91 on this Subcontractor Affidavit form (EXHIBIT A-1) prior to the commencement of any work under the contract/agreement;
- (3) Secure from any subcontractor(s) and/or their subcontractor(s) a completed Immigration Compliance Certification (EXHIBIT A-2) prior to the commencement of any work under the contract/agreement;
- (4) Provide the subcontractor(s) with legal notice that Cobb County, Georgia, reserves the right to dismiss, or require the dismissal of, any contractor or subcontractor for failing to provide the affidavit and/or for failure to comply with the requirements referenced in the affidavit;
- (5) Maintain records of such compliance and provide a copy of each such verification to Cobb County, Georgia, at the time the subcontractor(s) is retained to perform such services or upon any request from Cobb County, Georgia; and
- (6) Maintain such records for a period of five (5) years.

EEV (E-Verify) Program User ID Number

EEV Program Date of Authorization

BY: Authorized Officer or Agent
[Subcontractor Name]

Subcontractor Business Name

Printed Name

Date

SWORN AND SUBSCRIBED BEFORE ME

ON THIS THE ____ DAY OF _____, 201_

Notary Public Commission Expires: _____

Version 9/20/13

IMMIGRATION COMPLIANCE CERTIFICATION
(Required to be completed by Contractors and all Subcontractors)
(EXHIBIT A-2)

I certify to the Cobb County Board of Commissioners that the following employees will be assigned to:

<i>(Project Name/Description)</i>		

I further certify to Cobb County, Georgia the following:

- The E-Verify program was used to verify the employment eligibility of each of the above-listed employees hired after the effective date of our contract to use the program;
- We have not received a Final Nonconfirmation response from E-Verify for any of the employees listed.
- If we receive a Final Nonconfirmation response from E-Verify for any of the employees listed above, we will immediately terminate that employee's involvement with the project.
- I have confirmed that we have an I-9 on file for every employee listed above and that to the best of my knowledge all the I-9's are accurate.
- To the best of my knowledge and belief, all of the employees on the above list are legally authorized to work in the United States.
- If any other employee is assigned to this Cobb County project, a certification will be provided for said employee prior to the employee commencing work on the project.

To the best of my knowledge and belief, the above certification is true, accurate and complete.

Sworn to by:

Employer Name & Address:

Signature of Officer

Printed Name/Title

Date

SWORN AND SUBSCRIBED BEFORE ME

ON THIS THE ____ DAY OF _____, 201_

Notary Public
Commission Expires: _____

**EXHIBIT B
CONFLICT OF INTEREST AFFIDAVIT**

As a duly authorized representative of the firm _____, I, _____ with the title _____ certify that to the best of my knowledge no circumstances exist that will cause a conflict of interest in performing services for Cobb County, Georgia, that no employee of Cobb County, nor any public agency official or employee affected by this contract has any pecuniary interest in the business of this firm, associates or consultants of this firm, or the firm's parent firm, subsidiary, or other legal entity of which this firm is a part, and that no person associated with or employed by this firm has any interest that would conflict in any way, manner or degree with the performance of services for Cobb County.

Date: _____

Company Name: _____

Authorized Representative Name: _____

Title: _____

Signature: _____

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE ____ DAY OF _____, 20__.

Notary Public
My Commission Expires:

**EXHIBIT C
OFFICER'S OATH**

As a duly authorized representative of the firm involved in the bidding for or procuring the foregoing contract for Cobb County, Georgia I, _____ with _____ the _____ title _____ certify that I did not directly or indirectly prevent or attempt to prevent competition in such proposals by any means whatsoever. Nor did I prevent or endeavor to prevent anyone from making a bid or proposal therefor by any means whatsoever or induce another to withdraw a bid or proposal for the work.

Date: _____

Company Name: _____

Authorized Representative Name: _____

Title: _____

Signature: _____

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE ____ DAY OF _____, 20__.

Notary Public

My Commission Expires: _____

PAYMENT BOND

COBB COUNTY

BOND NO. _____

100% LABOR AND MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____, as Principal, hereinafter called a Contractor, and _____, a corporation duly organized under the laws of the State of _____, listed in the latest issue of U.S. Treasury Circular 570, and registered in State of Georgia, as Surety, are held and firmly bound unto **COBB COUNTY, GEORGIA**, hereinafter called Owner, in the sum of _____ **Dollars**, (\$ _____) or the total amount payable on the Project (see below), whichever is greater, for the payment of which sum, well and truly to be made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has entered into a written contract dated the _____ day of _____, 20 _____, with the Owner for **Cobb County Parks New Maintenance Building**, in accordance with drawings prepared for the Cobb County Parks, Recreation & Cultural Affairs Department.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise, it shall remain in full force and effect, subject, however, to the following conditions:

- A. A claimant is defined as one having a direct contract with the Contractor or with a Subcontractor of the Contractor for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.
- B. The above named Contractor and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expense of any such suit.
- C. No suit or action shall be commenced hereunder by any claimant,
 - 1. Unless claimant, other than one having a direct contract with the Contractor, shall have given written notice to any two of the following: the Contractor, the Owner, or the Surety above-named, within ninety (90) days after such claimant did or performed the last of the work of labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Contractor, Owner or Surety, at any place where any office is regularly maintained for the transaction of business or served in any manner

in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

2. Unless Owner requests a Continuation Certificate of this Bond, after one (1) year from the completion of Contract and the acceptance by Owner of the work thereunder, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
3. Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, and not elsewhere.
4. The amount of this bond shall be reduced by and to the extent of any payment of payments made in good faith hereunder, inclusive of the payment by surety of mechanics' liens which may be filed on record against said improvement, whether or not claim for the amount of such presented under and against this bond.

PROVIDED FURTHER, that the Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED FURTHER, that no final settlement between Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claims may be unsatisfied.

THE REMAINDER OF THIS PAGE HAS BEEN LEFT BLANK INTENTIONALLY.

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this _____ day of _____, 20__.

PRINCIPAL:

Attest:

_____ (SEAL)

Principal (Bidder)

Signature

Typed Name

Title

SURETY:

Attest:

_____ (SEAL)

Surety

Signature Attorney-in-Fact

Typed Name

Telephone Number

(Attach Certified and Dated Power of Attorney)
DO NOT DATE PAYMENT BOND. BOND DOCUMENT WILL BE DATED BY BOC.
(Bond must not be dated prior to date of Agreement)

**PERFORMANCE BOND
COBB COUNTY**

BOND NO. _____

100% PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____, as Principals, hereinafter called Contractor, and _____, a corporation duly organized under the laws of the State of _____, listed in the latest issue of U.S. Treasury Circular 570, and registered in the State of Georgia, as Surety, are held and firmly bound unto **COBB COUNTY, GEORGIA**, hereinafter called Owner, in the sum of _____ **Dollars**, (\$ _____) or the total amount payable on the Project (see below), whichever is greater, for payment of which sum, well and truly to be made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has entered into a written contract dated the _____ day of _____, 20 _____, with the Owner for **Cobb County PARKS New Maintenance Building**, in accordance with drawings and specifications prepared for the Cobb County Parks, Recreation, and Cultural Affairs Department, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void otherwise shall remain in full force and effect. The Surety hereby waives notice of any change to the Contract, including changes to the total amount payable, alteration or extension of time made by the Owner, as well as any change related subcontracts, purchase orders, task orders, change orders, and other obligations. Whenever Contractor shall be, and declared by Owner to be in default under the Contract, the owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

- A. Complete the Contract in accordance with its terms and conditions; or,
- B. Obtain a bid or bids for completing the Contract in accordance with its terms, and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be default or a succession of defaults) under the contract or contracts of completion arranged under this paragraph sufficient funds to pay the cost of completion less the balance of the contract prices; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract Price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this Bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due unless Owner requests a Continuation Certificate to extend the required warranty period. In such case, the expiration of the period in which to sue continues until two years after the

completion of any corrective work required. No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

The Contractor is required to provide the Owner a one-year guarantee covering workmanship and materials of the Project. This Performance Bond shall remain in force for one year from the date of Acceptance of the Project by the Owner unless Owner requests a Continuation Certificate to extend the expiration date of this Bond.

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this _____ day of _____, 20__.

PRINCIPAL:

Attest:

_____ (SEAL)

Principal (Bidder)

Signature

Typed Name

Title

SURETY:

Attest:

_____ (SEAL)

Surety

Signature Attorney-in-Fact

Typed Name

Telephone Number

(Attach Certified and Dated Copy of Power of Attorney)

DO NOT DATE PERFORMANCE BOND. BOND DOCUMENT WILL BE DATED BY BOC.

(Bond must not be dated prior to date of Agreement)

General Notes:

1. DEVELOPER: COBB COUNTY, THE SITE CONTAINS APPROX. 2.5 ACRES LAND DISTURBANCE AREA ± 0.39 ACRES. CONTRACTOR SHALL CONTACT THE UTILITIES LOCATOR AS REQUIRED BY GEORGIA LAW AND HAVE ALL UTILITIES MARKED PRIOR TO ANY CONSTRUCTION ACTIVITY. CONTRACTOR SHALL ALSO PROVIDE PRIVATE UTILITY CONTRACTOR WITH ALL INFORMATION NECESSARY TO LOCATE AND MARK ALL UTILITIES PRIOR TO ANY CONSTRUCTION ACTIVITY.
2. CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ARCHITECT AND ENGINEER OF RECORD OF ANY DISCREPANCIES, OMISSIONS, OR CONFLICTS THAT MAY ARISE FROM ANY CONSTRUCTION DOCUMENTS, FIELD SURVEY, AND OTHER INSTALLATIONS REQUIRED TO PROTECT PERSONS AND PROPERTY DURING THE ENTIRE CONSTRUCTION PROCESS. CONTRACTOR SHALL IMMEDIATELY NOTIFY ARCHITECT AND ENGINEER OF RECORD OF ANY DISCREPANCIES, OMISSIONS, OR CONFLICTS THAT MAY ARISE FROM ANY CONSTRUCTION DOCUMENTS, FIELD SURVEY, AND OTHER INSTALLATIONS REQUIRED TO PROTECT PERSONS AND PROPERTY DURING THE ENTIRE CONSTRUCTION PROCESS.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE PROJECT SITE AND RELOCATED TEMPORARY FENCING MAY BE REQUIRED THROUGH THE PROGRESSIVE STAGES OF CONSTRUCTION.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
5. ALL BUILDING FOUNDATIONS LAYOUT SHALL BE COORDINATED USING THE ARCHITECTURAL DRAWINGS ONLY. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE FOUNDATION LAYOUT SHALL BE COORDINATED WITH THE ARCHITECTURAL DRAWINGS ONLY.
6. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE FOUNDATION LAYOUT SHALL BE COORDINATED WITH THE ARCHITECTURAL DRAWINGS ONLY.
7. ALL UNDERGROUND UTILITIES SERVING OR CROSSING THE PREMISES EXISTING THAT HAVE NOT BEEN SHOWN PRIOR TO ANY CONSTRUCTION ACTIVITY. ALL UNDERGROUND UTILITY LOCATIONS MUST BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION ACTIVITY.
8. ALL STRIPS AND PAVEMENT MARKINGS WITHIN QUANTITY CITY RIGHT OF WAY S TO BE: THERMOPLASTIC.
9. AS ALL DRAWINGS OF ROADWAYS, STORM DRAINAGE, SEWER AND WATER, REQUIRED PRIOR TO ACCEPTANCE OR ISSUANCE OF A CERTIFICATE OF OCCUPANCY.
10. ALL RETAINING WALLS SHALL BE CONSTRUCTED WITHIN QUANTITY CITY RIGHT OF WAY S TO BE: THERMOPLASTIC.
11. ALL RETAINING WALLS SHALL BE CONSTRUCTED WITHIN QUANTITY CITY RIGHT OF WAY S TO BE: THERMOPLASTIC.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE FOUNDATION LAYOUT SHALL BE COORDINATED WITH THE ARCHITECTURAL DRAWINGS ONLY.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
14. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
15. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
16. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.

Cobb County General Notes:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE FOUNDATION LAYOUT SHALL BE COORDINATED WITH THE ARCHITECTURAL DRAWINGS ONLY.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
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16. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.

Structural Notes:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.

Cemetery Note

CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.

NOT	SPC	CORUS	SPR-2022-00
ZONING	RPC	CONCRETE	CONCRETE
ANNOYANCE	STRUCTURAL	STRUCTURAL	DESIGN/DEVELOP
PRE	CONCRETE	CONCRETE	CONCRETE

Phil probably wont respond

Name doesn't match name on specifications. I used this name in the Bid Documents.

24 HR EMERGENCY CONTACT: Phil Crisp 770-256-8416
CONSTRUCTION DRAWINGS

Cobb County Parks New Maintenance Building

LL-406 - 19th Dist.
1792 County Services Parkway
Marietta, GA 30008
PIN 1904.0600010

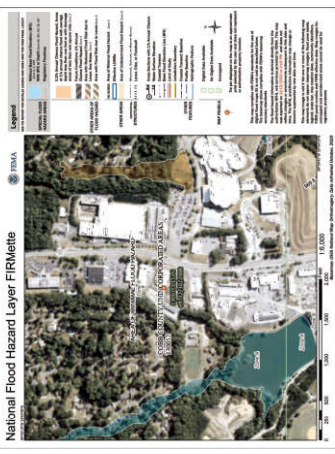


Construction Narrative

THE PROPOSED PROJECT CALLS FOR THE CONSTRUCTION OF A ONE STORY MAINTENANCE BUILDING (5000 SF).

THE PROJECT WILL BE CONSTRUCTED WITHIN THE COUNTY RIGHT OF WAY. ALL UTILITIES SERVING OR CROSSING THE PREMISES EXISTING THAT HAVE NOT BEEN SHOWN PRIOR TO ANY CONSTRUCTION ACTIVITY SHALL BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION ACTIVITY.

POWER WILL BE PROVIDED FROM EXISTING COMMERCIAL SERVICES SERVING THE AREA. A NEW ON-SITE SEWAGE SYSTEM UTILIZING 500 GALLON EFFLUENT TANK AND NEW DRAIN FIELD.



THIS PROPOSED SITE IS NOT LOCATED WITHIN A FLOOD HAZARD AREA AS INDICATED BY THE ATTACHED FIRM COMMUNITY PANEL

Erosion Control Certification

I CERTIFY THAT THE PERMITTEE'S EROSION CONTROL, SEDIMENTATION AND POLLUTION CONTROL PLAN PROVIDES FOR AN APPROPRIATE AND COMPREHENSIVE SYSTEM OF EROSION CONTROL AND POLLUTION CONTROL, AND THAT THE PERMITTEE HAS TAKEN ALL NECESSARY PRECAUTIONS TO PROTECT ADJACENT PROPERTIES AND THE ENVIRONMENT FROM EROSION, SEDIMENTATION AND POLLUTION DURING CONSTRUCTION. I AM A MEMBER OF THE EROSION CONTROL AND SEDIMENTATION CONTROL BOARD FOR THE STATE OF GEORGIA, AND I HAVE BEEN TRAINED IN THE USE OF THE NATIONAL EROSION CONTROL MANUAL AND THE NATIONAL POLLUTION CONTROL MANUAL. I HAVE CONDUCTED A VISUAL INSPECTION OF THE PROJECT SITE AND I HAVE DETERMINED THAT THE PERMITTEE'S EROSION CONTROL, SEDIMENTATION AND POLLUTION CONTROL PLAN COMPLIES WITH THE REQUIREMENTS OF THE NATIONAL EROSION CONTROL MANUAL AND THE NATIONAL POLLUTION CONTROL MANUAL.

SIGNED: *[Signature]* PE - (8763) GEORGIA REGISTRATION #

SITE DISTURBED AREA IS NOT LOCATED WITHIN 200 FT OF A STATE WATER

I CERTIFY UNDER THE PENALTY OF LAW THAT THIS PLAN WAS PREPARED BY ME OR BY A LICENSED PROFESSIONAL ENGINEER OR ARCHITECT REGISTERED IN THE STATE OF GEORGIA. I HAVE NOT BEEN CONVICTED OF ANY CRIMINAL OFFENSE THAT INVOLVES PERJURY, FALSIFICATION OF RECORDS, OR FRAUD.

SIGNED: *[Signature]* DATE: 12/14/2022

Construction Activity Schedule

ACTIVITY	START DATE	END DATE
UTILITY WORK	12/15/22	12/20/22
FOUNDATION	12/20/22	12/25/22
FLOORING	12/25/22	1/5/23
MECHANICAL/ELECTRICAL	1/5/23	1/15/23
PAINTING	1/15/23	1/25/23
LANDSCAPE	1/25/23	2/5/23



REVISIONS

NO.	DATE	DESCRIPTION

The Building, as an improvement to the land, shall be constructed in accordance with the plans, specifications, and conditions approved by the Cobb County Board of Commissioners, and shall be subject to the terms, conditions, and covenants of any deed, lease, or other instrument affecting the land.

Owner / Developer
Cobb County
100 Cherokee Street
Suite 300
Marietta, GA 30060

Cobb County Parks
New Maintenance Building
1792 County Services Parkway
Marietta, GA 30008

NOT ISSUED FOR CONSTRUCTION
PROJECT NO: SPR-2022-00
DATE: 12-14-2022
SHEET TITLE: COVER SHEET

CONTRACTOR MUST CALL THE UTILITIES PROTECTION CENTER CALL BEFORE YOU DIG TELEPHONE NUMBER (1-800-483-3143) FOR ALL DAYS BEFORE EXCAVATION.

TOTAL SITE AREA: 4.0 ACRES
TOTAL SITE DISTURBED: 0.39 ACRES

Know what's below. Call before you dig. Or call 800-483-3141

Legend

COVER SHEET
PROJECT NOTES
OVERALL SITE PLAN
DEMOLITION PLAN
SITE PLAN
GRADING PLAN
UTILITY PLAN

Sheet #
C-00
C-01
C-10
C-20
C-30
C-40
C-50
C-62
C-63
C-64
C-80
C-81
T-10

EROSION CONTROL - INITIAL PHASE
EROSION CONTROL - INTERMEDIATE PHASE
EROSION CONTROL - FINAL PHASE
DETAILS
TREE PROTECTION & REPLACEMENT PLAN

SPR-2022-00

ARBORIST NOTE
THE CONTRACTOR SHALL NOTIFY THE STATE ARBORIST TO CONDUCT AN ON-SITE ARBORIST SURVEY TO IDENTIFY ANY PRESENT OR POTENTIAL TREES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE ARBORIST SHALL BE RESPONSIBLE FOR IDENTIFYING ANY PRESENT OR POTENTIAL TREES AND FOR PROVIDING A TREE SURVEY REPORT TO THE CONTRACTOR.

GSWCC Certification:
THE CONTRACTOR HAS BEEN TRAINED IN THE USE OF THE NATIONAL EROSION CONTROL MANUAL AND THE NATIONAL POLLUTION CONTROL MANUAL. I HAVE CONDUCTED A VISUAL INSPECTION OF THE PROJECT SITE AND I HAVE DETERMINED THAT THE PERMITTEE'S EROSION CONTROL, SEDIMENTATION AND POLLUTION CONTROL PLAN COMPLIES WITH THE REQUIREMENTS OF THE NATIONAL EROSION CONTROL MANUAL AND THE NATIONAL POLLUTION CONTROL MANUAL.

PLANNED PERMITTEE AND DATE: *[Signature]*

Engineer
BREWER ENGINEERING, INC.
2050 RIVERSIDE DRIVE
SUITE 100
ATLANTA, GA 30339
770-370-1710

Owner / Developer
Cobb County
100 Cherokee Street
Suite 300
Marietta, GA 30060



NO.	DATE	DESCRIPTION
1	12-16-2022	FINAL APPROVAL

It is hereby certified that the undersigned is a duly Licensed Professional Engineer in the State of Georgia, No. 10684, and that the above is a true and correct copy of the original as shown to the undersigned on the date hereon.

David R. Hester
Professional Engineer
State Engineering, Inc.

Owner/Developer
Cobb County
100 Cherokee Street
Suite 300
Marietta, GA 30060

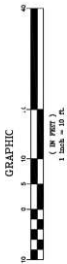
New Maintenance Building
Cobb County Parks
1792 County Services Parkway
Marietta, GA 30060

NOT ISSUED FOR CONSTRUCTION
PROJECT NO.: 220808
DATE: 12-16-2022
SHEET TITLE:

SITE PLAN
SHEET NO.: C-3.0



Provide dimensions for gravel parking.



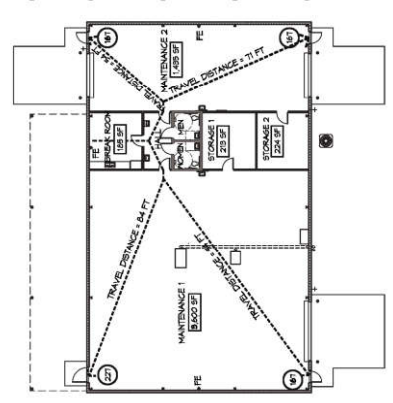
GENERAL NOTES:

1. ALL EXTERIOR DOORS ARE NON-SWING.
2. ALL EXTERIOR DOORS AND WINDOWS IN THE MANSION OF EXHIBITS SHALL BE PROVIDED WITH THE REQUIREMENTS OF THE RESPECTIVE MANUFACTURER. INTERIOR FINISH PRODUCTS SHALL BE PROVIDED PER THE REQUIREMENTS OF THE RESPECTIVE MANUFACTURER. PROVIDER VERIFICATION AT THE TIME OF FINAL INSPECTION SHALL BE PROVIDED TO THE ARCHITECT. PROVIDER SHALL PROVIDE VERIFICATION AT THE TIME OF FINAL INSPECTION THAT THE FINISHES COMPLY WITH THE REQUIREMENTS OF THE MANUFACTURER.
3. IT SHALL CONSIST OF CROSS BARS OR BUSH PINS. THE ACTUATING PORTION OF EACH EXTENSION SHALL NOT BE LESS THAN 1/4" IN THICKNESS NOR MORE THAN 1/8" INCHES ABOVE THE FLOOR.
4. IT SHALL BE CONSTRUCTED SO THAT A HORIZONTAL FORCE OF 150 LBS. WILL ACTIVATE THE CROSS BAR OR BUSH PIN AND LATCH.
5. NFFA 101.19.2.2.2.2. NFFA 101.19.2.1.1.1.1.
6. INDOOR GLASS DOORS AND WINDOWS ARE TEMPERED.
7. (DOOR) HANDLES, HANDLES, PULLS, LATCHES, LOCKS AND OTHER OPERATING DEVICES ON ACCESSIBLE DOORS SHALL NOT REQUIRE TIGHT GRIPPING, TIGHT GRIPPING OR GRIPPING. THE HANDLES, HANDLES AND OTHER OPERATING DEVICES SHALL BE ACCEPTABLE DESIGNS. SEE 190.9.0-2.0-2.4. (R) SHALL BE PROVIDED. GEORGIA ACCESSIBILITY CODE.
8. ALL OPENINGS TO BE MADE UNLESS OTHERWISE NOTED.
9. MESSAGES OF WIRE, CONDUITS, BUS DUCTS, CABLES, WIRES, AND OTHER DEVICES SHALL BE PROTECTED AS FOLLOWS: THE SPACE BETWEEN THE MESSAGE AND THE MESSAGE SHALL BE FILLED WITH A MATERIAL CAPABLE OF MAINTAINING THE FIRE RESISTANCE OF THE MESSAGE. THE MESSAGE SHALL BE USED AS PART OF THE MESSAGE. THE MESSAGE SHALL BE USED AS PART OF THE MESSAGE.
10. COMPLY WITH THE 2018 INTERNATIONAL BUILDING CODE SECTION 5001 FIRE EXTINGUISHERS DISPENSATION.

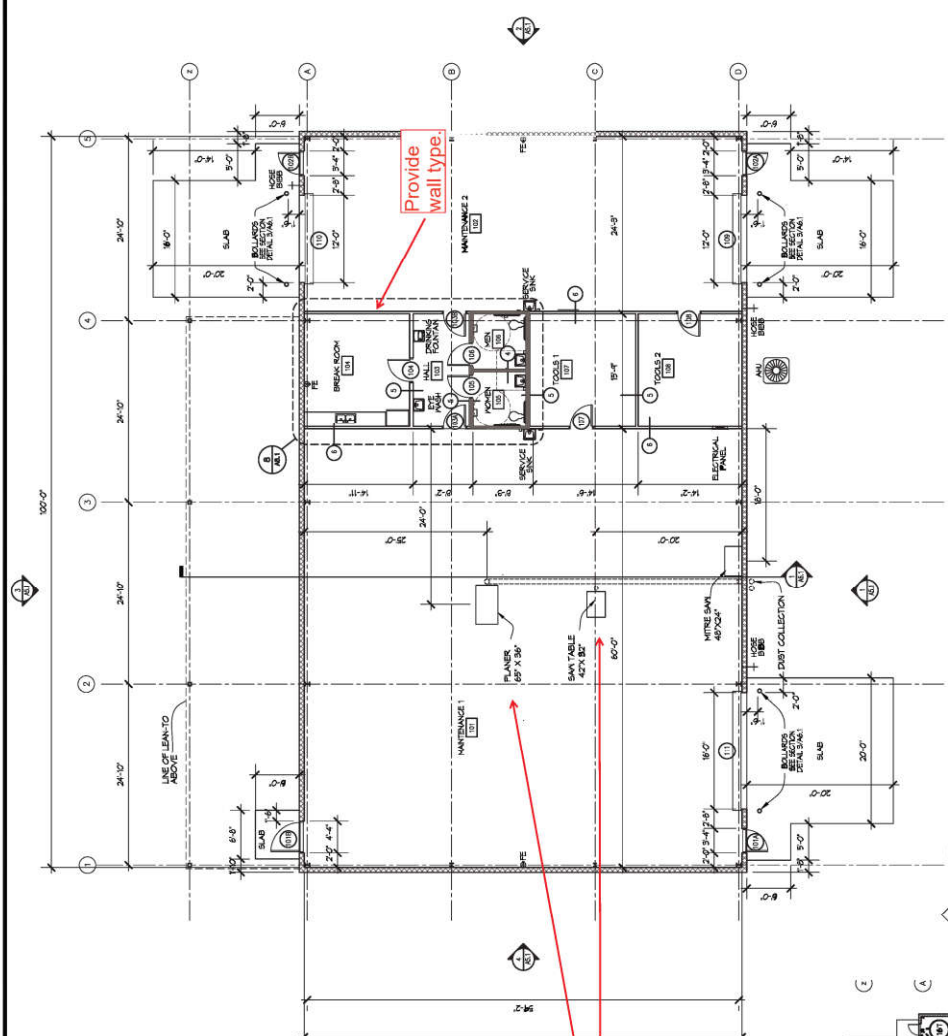
Are planner and saw table to be provided by contract. If so, provide a spec. If not, show as NIC.

OCCUPANT LOAD SCHEDULE

Room Name & Number	Occupancy Class	Area (sq. ft.)	Occupant Load
MAINTENANCE 1	INDUSTRIAL	1487.00	19
MAINTENANCE 2	INDUSTRIAL	1487.00	19
ASSEMBLY	1097.75	15	
STORAGE 1	INDUSTRIAL	234.00	3
STORAGE 2	INDUSTRIAL	234.00	3
TOTAL OCCUPANT LOAD	INDUSTRIAL		60



LIFE SAFETY PLAN
SCALE: 1/8"=1'-0"



LIFE SAFETY LEGEND

OCCUPANCY CLASSIFICATION

INDUSTRIAL

EXHIBITS COMPONENT CAPACITY

EXHIBITS: 197 PERSONS

TYP. 30' SINGLE DOOR: 19 PERSONS

TYP. 12' SINGLE DOOR: 8 PERSONS

OCCUPANT LOAD: 60 PERSONS

FOR PRICING

REVISIONS:

NO.	DATE	DESCRIPTION

Cobb County Parks
New Maintenance Building
1792 County Services Parkway, Building 800
Marietta, GA 30008

FOREMAN | SEELY | FOUNTAIN
architecture
3091 Governor Lake Drive, Suite 150, Peachtree Corners, Georgia 30071
(770) 729-8433 www.seelyefountain.com fax (770) 729-8466

A2.1

Sheet Title: MAINTENANCE BUILDING LIFE SAFETY PLAN

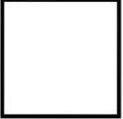
Drawn By: S.F.

Scale: AS NOTED

Date: 03/11/2024

Job No.: 22014

Sheet No.:



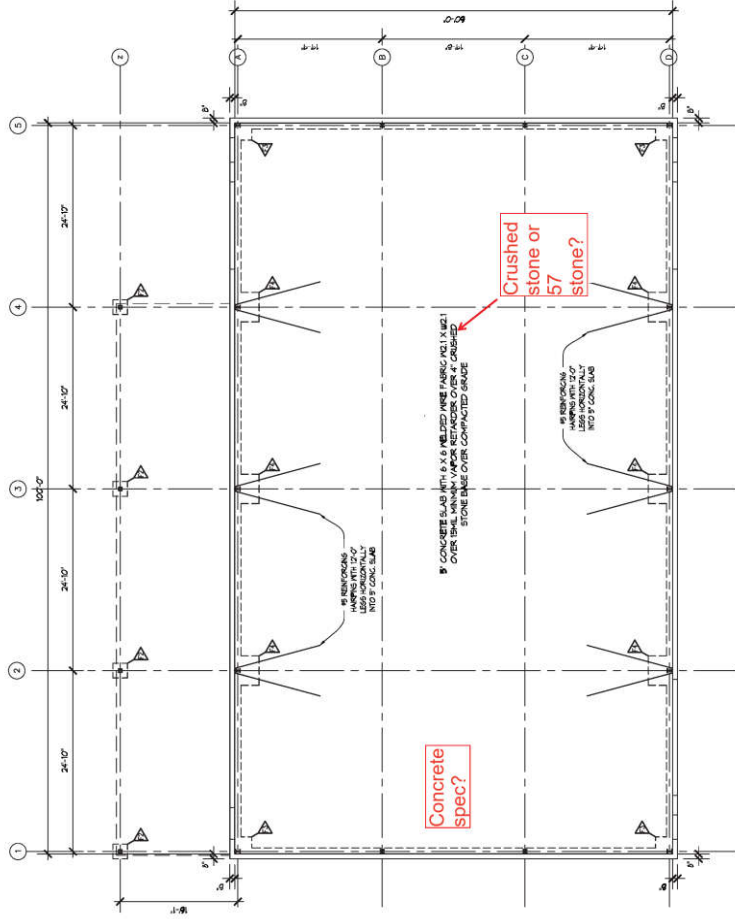
CONTRACTOR'S RESPONSIBILITY: The contractor shall be responsible for obtaining all necessary permits and for ensuring that all work complies with applicable codes and regulations.

REVISIONS:

Cobb County Parks
New Maintenance Building
 1792 County Services Parkway, Building 800
 Marietta, GA 30008

FORMAN | SEELEY | FOUNTAIN
 architecture
 3091 Governors Lake Drive, Suite 150, Marietta Center, Georgia 30071
 (770) 729-8433 www.fsarchitecture.com fax (770) 729-8466

Sheet Title: FOUNDATION PLAN
 Drawn By: S.F.
 Scale: AS NOTED
 Date: 09/11/2024
 Job No.: 2204
 Sheet No.: **A2.2**

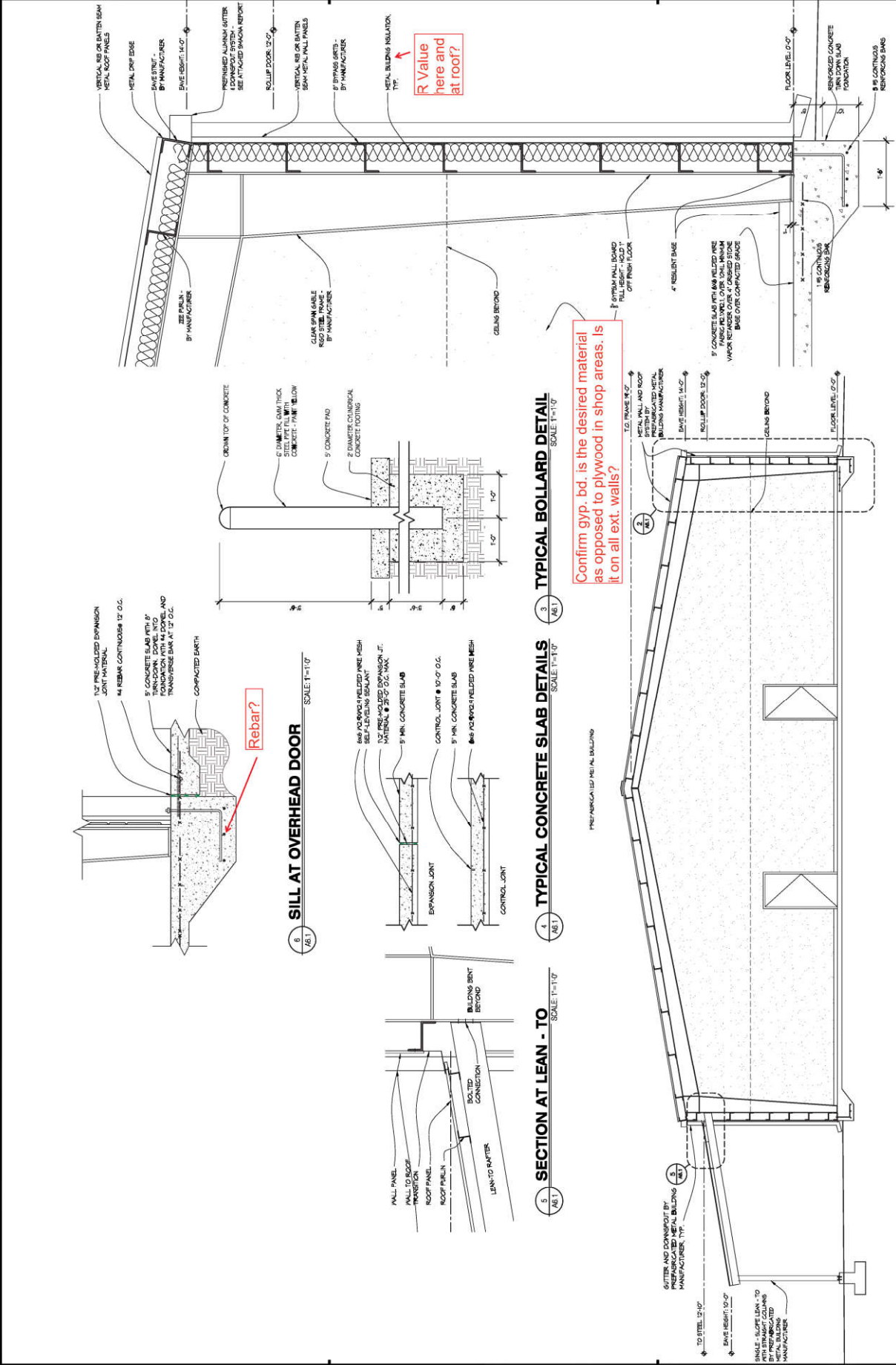


FOUNDATION PLAN
 SCALE: 1/8"=1'-0"

FOOTING SCHEDULE

TYPE	LENGTH	WIDTH	DEPTH	REINFORCEMENT
△	2'-0"	2'-0"	1'-6"	4 #5 - EACH WAY
△	3'-0"	3'-0"	1'-6"	4 #5 - EACH WAY
△	4'-0"	4'-0"	1'-6"	5 #5 - EACH WAY

FOR PRICING



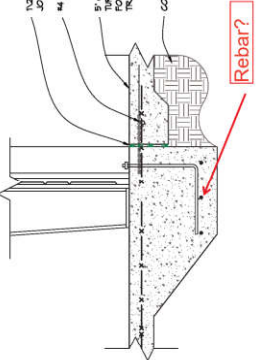
5 SECTION AT LEAN - TO SCALE: 1/4"=1'-0"

4 TYPICAL CONCRETE SLAB DETAILS SCALE: 1/4"=1'-0"

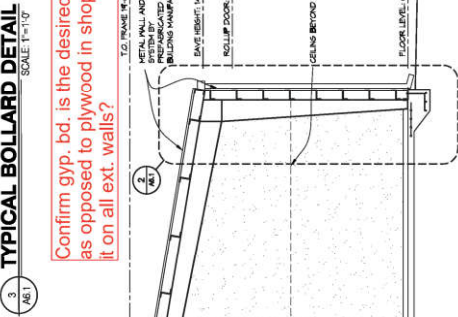
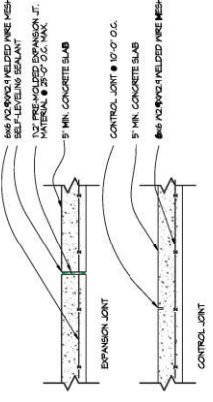
3 TYPICAL BOLLARD DETAIL SCALE: 1/4"=1'-0"

1 TRANSVERSE BUILDING SECTION SCALE: 1/4"=1'-0"

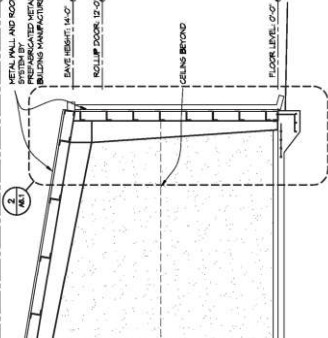
2 TYPICAL WALL SECTION SCALE: 1/4"=1'-0"



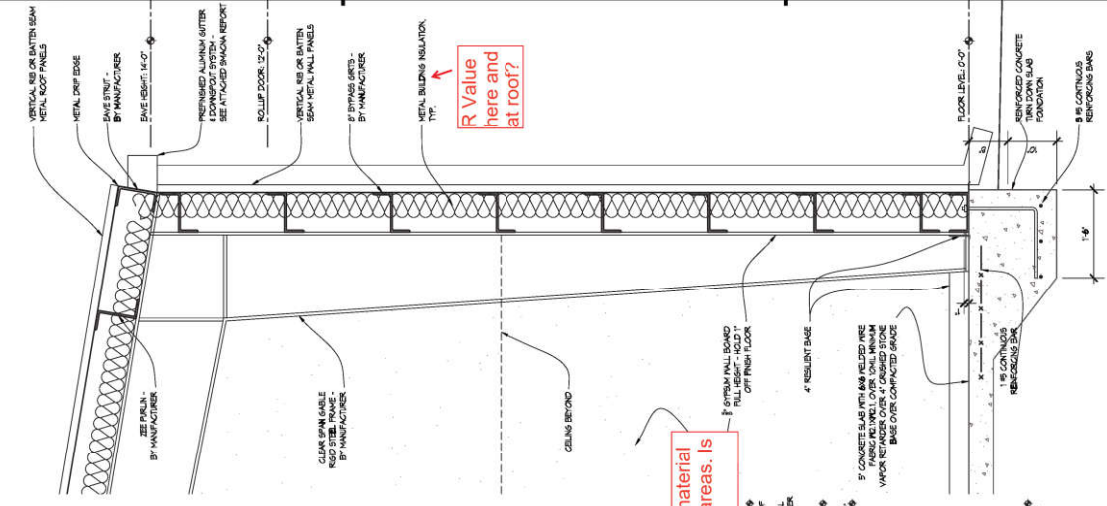
6 SILL AT OVERHEAD DOOR SCALE: 1/4"=1'-0"



Confirm gyp. bd. is the desired material as opposed to plywood in shop areas. Is it on all ext. walls?



2 TYPICAL WALL SECTION SCALE: 1/4"=1'-0"



R Value here and at roof?

NO.	REVISIONS

CONFIRM CONCRETE REBAR IS BEING USED FOR ALL WALLS AND ROOF. SEE ATTACHED BOLLARD DETAIL.

VERTICAL RIS OR BATTEN SEAM METAL ROOF PANELS

METAL DWP SIDE

DAVE STEIN - BY MANUFACTURER

EAVE HEIGHT: 14'-0"

REINFORCED ALUMINUM GUTTER SEE ATTACHED BOLLARD DETAIL

ROOLUP DOOR: 12'-0"

VERTICAL RIS OR BATTEN SEAM METAL WALL PANELS

8" STUDS Girts - BY MANUFACTURER

METAL BUILDING INSULATION TYP.

R Value here and at roof?

CEILING BEYOND

CEILING BEYOND

CEILING BEYOND

FLOOR LEVEL: 0'-0"

REINFORCED CONCRETE FLOOR AND FOUNDATION

8" x 8" CONTINUOUS REBAR-CORNER BARS

SEE PLAN - BY MANUFACTURER

GLASS SPAN GABLE REGR STEEL FRAME - BY MANUFACTURER

8" METAL WALL BRACKETS - HOLD OFF FINISH FLOOR

4" RESILIENT BASE

5" CONCRETE SLAB WITH 6#8 WELDED WIRE FABRIC REINFORCED OVER 2" MINIMUM WORKING FILL. BASE OVER COMPACTED GRADE

15" CONTINUOUS REBAR-CORNER BARS

CEILING BEYOND

CEILING BEYOND

FLOOR LEVEL: 0'-0"

CEILING BEYOND

FLOOR LEVEL: 0'-0"

TO FINISH 14'-0"

METAL WALL AND ROOF PREFABRICATED METAL BUILDING MANUFACTURER

EAVE HEIGHT: 14'-0"

ROOF PANELS TO BE MATCHED TO MANUFACTURER

GUTTER AND DOWNSPOUT BY PREFABRICATED METAL BUILDING MANUFACTURER, TYP.

TO STEEL 12'-0"

EAVE HEIGHT: 10'-0"

ROOF PANELS TO BE MATCHED TO MANUFACTURER

TO STEEL 14'-0"

METAL WALL AND ROOF PREFABRICATED METAL BUILDING MANUFACTURER

EAVE HEIGHT: 14'-0"

ROOLUP DOOR: 12'-0"

CEILING BEYOND

FLOOR LEVEL: 0'-0"

CEILING BEYOND

FLOOR LEVEL: 0'-0"

CEILING BEYOND

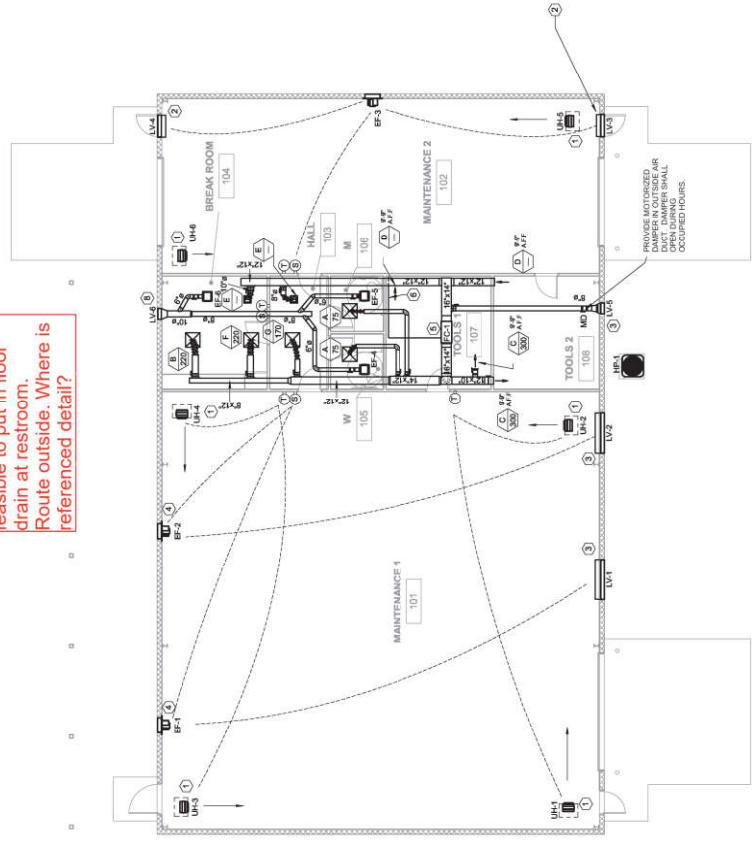
FLOOR LEVEL: 0'-0"

CEILING BEYOND

- GENERAL NOTES:**
1. PENETRATIONS THROUGH WALLS SHALL BE SEALED. THE STRUCTURAL SPACE BETWEEN THE DUCT AND WALL SHALL BE SEALED WITH CALK, WHEN FIRE SMOKE OR THE SMOKE DAMPERS ARE USED, REFER TO THE MANUFACTURER'S REQUIREMENTS FOR SEALING.
 2. ALL FIRE DAMPERS AND FIRESTOP DAMPERS SHALL HAVE A MINIMUM FIRE RESISTANCE RATING OF 1.5 HOURS U.L.O.
 3. ALL MECHANICAL EQUIPMENT SHALL BE CONTROLLED BY A COMPUTERIZED ENERGY MANAGEMENT SYSTEM.
 4. MECHANICAL CONTRACTOR SHALL COORDINATE AND PROVIDE ACCESS PANELS TO THE GENERAL CONTRACTOR TO INSTALL AS REQUIRED.
 5. THE BID DOCUMENTS ARE DESIGNED BASED ON THE BASIS OF DESIGN. IF A LISTED "EQUAL" IS USED BY THE MECHANICAL CONTRACTOR'S ADDITIONAL COST TO THE OWNER. VISITS AND MODIFICATIONS REQUIRED TO ACCOMMODATE THE "EQUAL" MANUFACTURER, NO ADDITIONAL COST TO THE OWNER.
 6. COVER LOCATED IN ADMINISTRATION AREA TO SHUT DOWN ALL EXHAUST FANS AND CLOSE ALL OUTSIDE AIR DAMPERS WHEN DEPRESSURIZED.
 7. MINIMUM 2" SEPARATION BETWEEN COIL, ATTACHES AND EXHAUST OF EXHAUSTING VENTS.
 8. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 9. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 10. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 11. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 12. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 13. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 14. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 15. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 16. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 17. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 18. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 19. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 20. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 21. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 22. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 23. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 24. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 25. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 26. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 27. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 28. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 29. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.
 30. PROVIDE 2" MINIMUM CLEARANCE BETWEEN EXHAUSTING VENTS AND EXHAUSTING VENTS.

- KEYNOTE:**
1. MOUNT UNIT HEATER MINIMUM OF 12" AFF TO BOTTOM
 2. INSTALL LOWER 12" AFF TO CENTERLINE
 3. PROVIDE 2" MINIMUM CLEARANCE BETWEEN UNIT AND WALL
 4. NEW FAN COIL SHALL BE INSTALLED ON CEILING
 5. PROVIDE 2" MINIMUM CLEARANCE BETWEEN UNIT AND WALL
 6. COVER OVER CONDENSATE PIPE (SIMILAR TO REFRIGERANT PIPE COVER - JUST NOT TALL)
 7. INSTALL MINIMUM 2" AFF TO CENTERLINE
 8. INSTALL LOWER 12" AFF TO CENTERLINE

Provide more info on flow drain. Should this be floor drain? if so, not feasible to put in floor drain at restroom. Route outside. Where is referenced detail?



1 HVAC FLOOR PLAN
1/8" = 1'-0"

SYMBOL	DEFINITION	SYMBOL	DEFINITION
☒	SUPPLY DIFFUSER	☐	RETURN GRILLE
Ⓢ	AIR DEVICE DESIGNATOR	Ⓢ	THERMOSTAT
Ⓢ	RETURN GRILLE DESIGNATOR (TO BOTTOM OF WALLFACE)	Ⓢ	DUCTWORK OFFSETS
Ⓢ	SWITCH	Ⓢ	SENSOR DEVICE
Ⓢ	SENSOR DEVICE	Ⓢ	MANUAL VOLUME DAMPER
Ⓢ	EXHAUST FAN	Ⓢ	EXHAUST FAN
Ⓢ	UNIT HEATER	Ⓢ	LOUVER
Ⓢ	FAN COIL	Ⓢ	MOTORIZED DAMPER
Ⓢ	HEAT PUMP UNIT	Ⓢ	A.F.F. ABOVE FINISHED FLOOR
Ⓢ	UNLESS NOTED OTHERWISE		

MBA
CONSULTING ENGINEERS

MBA # 22247
MAYNARD HALL & ASSOCIATES, INC.
10000 W. 14th St., Suite 100
Denver, CO 80202
www.maynardhall.com

PERMIT PACKAGE

**Cobb County Parks
New Maintenance Building**
1792 County Services Parkway
Marietta, GA 30068

Sheet Title:
HVAC FLOOR PLAN

Drawn By: CO

Scale: AS NOTED

Date: 01/13/2023

JOB NO.: 228

Sheet No.: **M1.0**



COMPUTER GENERATED DRAWING
ANY CHANGES MUST BE MADE TO THE ORIGINAL DRAWING
DATE: 01/13/2023 09:28

REVISION	DATE	DESCRIPTION

SPLIT SYSTEM SCHEDULE										
MARK	CFM	QALPH	ESP (IN WG)	HP	REV CYCLE	REV CYCLE	REV CYCLE	REV CYCLE	REV CYCLE	REV CYCLE
FCU/HEAT	1000	200	0.50	0.50	20	20	20	20	20	20

1. COIL UNIT ON INTERNALLY LINED SHEET METAL RETURN PLENUM SUPPORTED BY ANGLE IRON FRAME PER DETAIL
 2. COIL UNIT ON EXTERNALLY LINED SHEET METAL RETURN PLENUM SUPPORTED BY ANGLE IRON FRAME PER DETAIL
 3. AIR FLOW DIRECTION: FAN COIL, CONDENSER REFRIG. PUMP, 4-TURN/44
 4. DIMENSIONS: FCU: 14.00" X 20.00" X 11.00"; PUMP: 15.00" X 15.00" X 7.00" X 3.40"

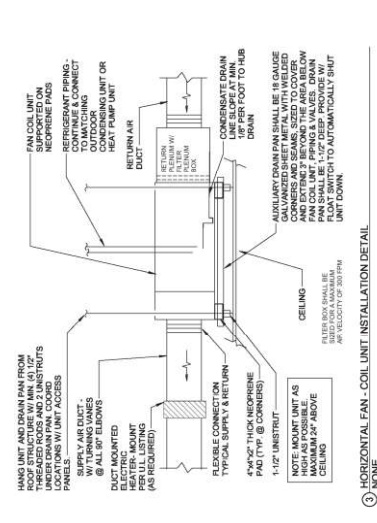
NOTES:
 1. COIL UNIT ON INTERNALLY LINED SHEET METAL RETURN PLENUM SUPPORTED BY ANGLE IRON FRAME PER DETAIL
 2. COIL UNIT ON EXTERNALLY LINED SHEET METAL RETURN PLENUM SUPPORTED BY ANGLE IRON FRAME PER DETAIL
 3. AIR FLOW DIRECTION: FAN COIL, CONDENSER REFRIG. PUMP, 4-TURN/44
 4. DIMENSIONS: FCU: 14.00" X 20.00" X 11.00"; PUMP: 15.00" X 15.00" X 7.00" X 3.40"

FAN SCHEDULE						
MARK	CFM	DRIVE	ES.P.	HP	TYPE	NOTES
EF-1	10000	DIRECT	0.38	2.00	SIDEWALL	10' MAINTENANCE 1 GREENHECK AER30-03-315-VG 2,3,4
EF-2	10000	DIRECT	0.38	2.00	SIDEWALL	10' MAINTENANCE 1 GREENHECK AER30-03-315-VG 2,3,4
EF-3	7000	DIRECT	0.35	2.00	SIDEWALL	102 MAINTENANCE 2 GREENHECK AER30-03-0315 2,3,4
EF-4	75	DIRECT	0.4	0.06	CEILING	106 W GREENHECK SP-A200 1,2
EF-5	75	DIRECT	0.4	0.06	CEILING	106 W GREENHECK SP-A200 1,2
EF-6	100	DIRECT	0.4	0.06	CEILING	104 BREAK ROOM GREENHECK SP-A200 1,2

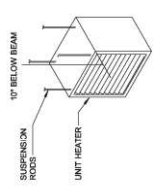
NOTES:
 1. PROVIDE WITH BACKDRAFT DAMPER AND SPEED CONTROLLER
 2. INTERLOCK OF FAN WITH LOUVER/MOTORIZED DAMPER, DAMPER SHALL OPEN WHEN FAN IS ENABLED.
 3. PROVIDE WITH WALL MOUNT HOOSING, MOTORIZED DAMPER, AND OUTLET CURB GUARD

AIR DISTRIBUTION SYSTEM					
ADMARK	TYPE	FACE BACK/FAN	NECK	FINISH	
A	SUPPLY	24 x 24	18 x 18	6"	WHITE
B	SUPPLY	24 x 24	18 x 18	10"	TITLUS TDC
C	RET/EXH	14 X 10	N/A	6 X 6	WHITE
D	RET/EXH	14 X 10	N/A	12 X 6	WHITE
E	RET/EXH	12 X 12	N/A	10 X 10	WHITE
F	SUPPLY	24 x 24	18 x 18	6 x 6	WHITE
G	SUPPLY	8 x 8	18 x 18	6 x 6	WHITE

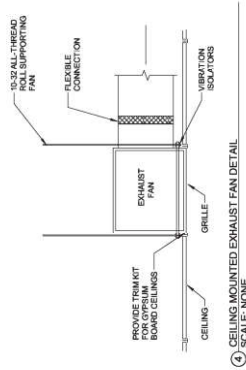
NOTES:
 1. PROVIDE TRANSITION FROM SQUARE NECK TO ROUND NECK.
 2. DIFFUSER SHALL BE SWAY BLOW TYPE. SEE DETAIL.



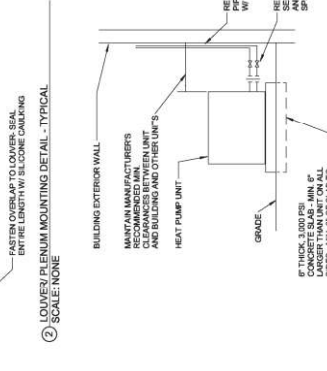
① HORIZONTAL FAN - COIL UNIT INSTALLATION DETAIL
SCALE: NONE



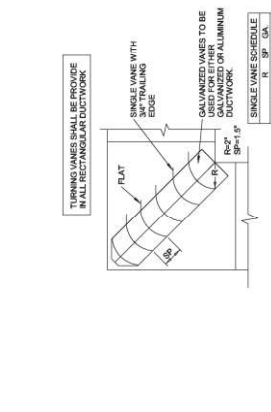
① UNIT HEATER DETAIL
SCALE: NONE



④ CEILING MOUNTED EXHAUST FAN DETAIL
SCALE: NONE



② LOUVER PLENUM MOUNTING DETAIL - TYPICAL
SCALE: NONE



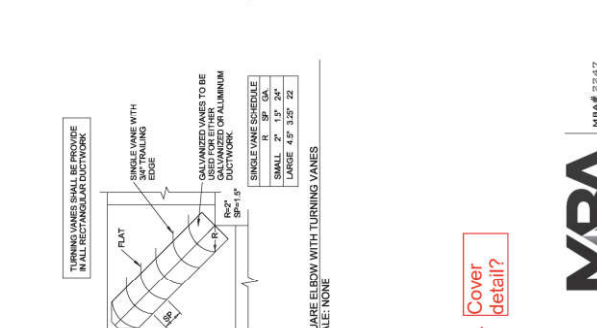
⑥ SQUARE ELBOW WITH TURNING VANES
SCALE: NONE

ELECTRIC HEATER SCHEDULE						
MARK	KW	CFM	LOCATION	NOTES		
UH-1	15.0	910	101 MAINTENANCE	ONMARK MUH-15-9 1,2		
UH-2	15.0	910	101 MAINTENANCE	ONMARK MUH-15-9 1,2		
UH-3	15.0	910	101 MAINTENANCE	ONMARK MUH-15-9 1,2		
UH-4	15.0	910	101 MAINTENANCE	ONMARK MUH-15-9 1,2		
UH-5	15.0	910	102 MAINTENANCE	ONMARK MUH-15-9 1,2		
UH-6	15.0	910	102 MAINTENANCE	ONMARK MUH-15-9 1,2		

NOTES:
 1. SUPPORT FROM STRUCTURE WITH THREADED RODS
 2. PROVIDE REMOTE THERMOSTAT

LOUVER SCHEDULE						
MARK	SIZE	FREE AREA SQ. FT.	SERVICE	NOTES		
LV-1	66" X 48"	11.4	101 MAINTENANCE 1	GREENHECK ESD-603 1,2		
LV-2	66" X 48"	11.4	101 MAINTENANCE 2	GREENHECK ESD-603 1,2		
LV-3	36" X 36"	4.34	102 MAINTENANCE 2	GREENHECK ESD-603 1,2		
LV-4	36" X 36"	4.34	102 MAINTENANCE 2	GREENHECK ESD-603 1,2		
LV-5	12" X 16"	0.43	FC-1 OUTSIDE AIR	GREENHECK ESD-603 1,3		
LV-6	12" X 16"	0.43	104 BREAK RM & RR EXHAUST	GREENHECK ESD-603 1,2		

NOTES:
 1. COORDINATE CUSTOM COLOR FROM FULL RANGE OF COLORS WITH ARCHITECT. LOUVER SHALL HAVE A FINISH FINISH.
 2. INTERLOCK OF FAN WITH LOUVER/MOTORIZED DAMPER, DAMPER SHALL OPEN WHEN FAN IS IN OPERATION.
 3. PROVIDE WITH MOTORIZED DAMPER, INTERLOCKED WITH FC-1. MOTORIZED DAMPER SHALL OPEN WHEN FAN COIL IS IN OPERATION DURING OCCUPIED HOURS.



⑤ OUTDOOR HEAT PUMP UNIT DETAIL
SCALE: NONE

COVER DETAIL?
 REFRIGERANT PIPING OF WALL COVER
 REFRIGERANT SERVICE VALVES
 REFRIGERANT SERVICE PIPING - SEE SPEC.



COBB COUNTY PARKS & RECREATION DEPARTMENT
 1772 COUNTY SERVICES PARKWAY
 MARIETTA, GA 30008

REVISIONS

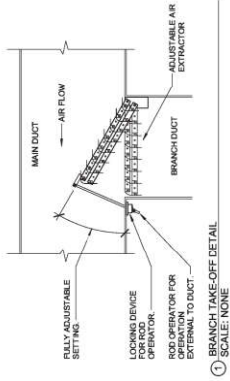
Cobb County Parks
New Maintenance Building
 1772 County Services Parkway
 Marietta, GA 30008

(770) 750-0000
 www.cobbcountyga.gov
 1000 Downtown Lake Drive, Suite 100, Marietta, Georgia 30067

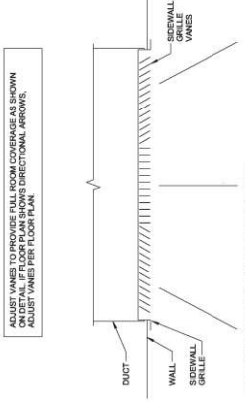
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 Drawn By: CO
 Scale: AS NOTED
 Date: 01/10/2023
 JDD No.: 228
 Sheet No.: M2.0



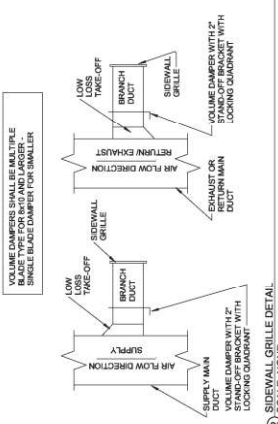
MBA # 2247
 MARIETTA, GA 30067
 1772 COUNTY SERVICES PARKWAY
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PERMIT PACKAGE



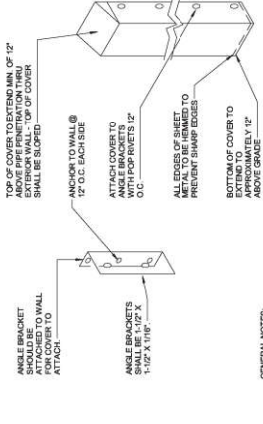
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SCALE: NONE



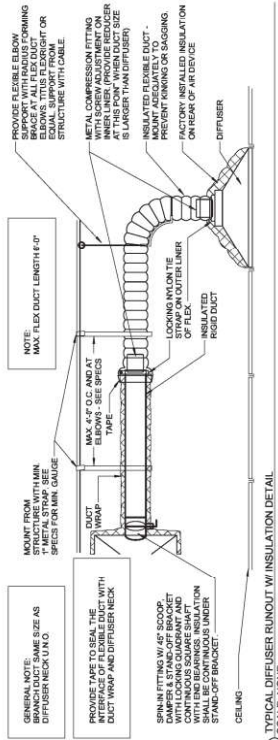
2. SIDEWALL GRILLE VANE ADJUSTMENT DETAIL
SCALE: NONE



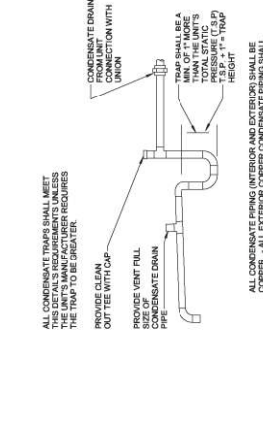
3. SIDEWALL GRILLE DETAIL
SCALE: NONE



4. SIDEWALL GRILLE DETAIL
SCALE: NONE



5. TYPICAL DIFFUSER RUNOUT W/ INSULATION DETAIL
SCALE: NONE



6. CONDENSATE TRAP DETAIL
SCALE: NONE

Where? Not in restrooms.



CONTRACT PACKAGE
MBA# 22247
1792 COUNTY SERVICES PARKWAY
MARIETTA, GA 30068

NO.	REVISIONS

Cobb County Parks
New Maintenance Building
1792 County Services Parkway
Marietta, GA 30068

3070 DOWNING LANE, SUITE 100, FARMERS BRANCH, GEORGIA 30751
(770) 423-7743 WWW.MBAENGINEERS.COM
DATE: 01/13/2023

Sheet Title:	HVAC DETAILS
Drawn By:	CO
Scale:	AS NOTED
Date:	01/13/2023
JOB NO.:	228
SHEET NO.:	M2.1

MBA
CONSULTING ENGINEERS

MBA# 22247
MAYNARD HALL ASSOCIATES, INC.
1100 W. GLENVIEW AVENUE SUITE 100
DARIEN, GA 30128
WWW.MBAENGINEERS.COM

PERMIT PACKAGE



FOREMAN | SEELEY | FOUNTAIN
 architecture
 3000 Governors Lake Drive, Suite 150, Peachtree Corners, Georgia 30071
 Tel: (770) 729-8488
 Fax: (770) 729-8488
 Email: info@foremanseelyefountain.com

Cobb County Parks
 New Maintenance Building
 1792 Marietta, GA 30008

E-3.1
 Sheet No.: 2209
 Job No.: 2209
 Date: 01/13/2023
 Scale: AS NOTED
 Drawn By: M.T.F.

HVAC/ELECTRICAL SCHEDULE

MARK	VOLTS/PHASE	FLA	WVA	WVA	MOCP	WIRE SIZE	NOTES
HP-1	208/1	15.0	3.7	-	40/2 (7) 50/2/7/6	2#R, 1#10G, 1/2"FC	-
EP-1	120/1	13.8	1.85	-	25/1	M.S.S. 2#10, 1#10G, 1/2"FC	-
EP-2	120/1	13.8	1.85	-	25/1	M.S.S. 2#10, 1#10G, 1/2"FC	-
EP-3	120/1	8.8	1.17	-	20/1	M.S.S. 2#12, 1#12G, 1/2"FC	-
EP-4	208/1	0.13	0.02	-	15/1	M.S.S. 2#12, 1#12G, 1/2"FC	-
EP-5	208/1	0.13	0.02	-	15/1	M.S.S. 2#12, 1#12G, 1/2"FC	-
EP-6	208/1	19.2	4.00	-	30/2	2#10, 1#10G, 1/2"FC	-
EP-7	208/1	27.7	5.78	-	45/2	2#4, 1#6G, 1"FC	-
UH-1	208/3	41.6	15.0	-	50/3	3#R, 1#10G, 1"FC	-
UH-2	208/3	41.6	15.0	-	50/3	3#R, 1#10G, 1"FC	-
UH-3	208/3	41.6	15.0	-	50/3	3#R, 1#10G, 1"FC	-
UH-4	208/3	41.6	15.0	-	50/3	3#R, 1#10G, 1"FC	-
UH-5	208/3	41.6	15.0	-	50/3	3#R, 1#10G, 1"FC	-
UH-6	208/3	41.6	15.0	-	50/3	3#R, 1#10G, 1"FC	-

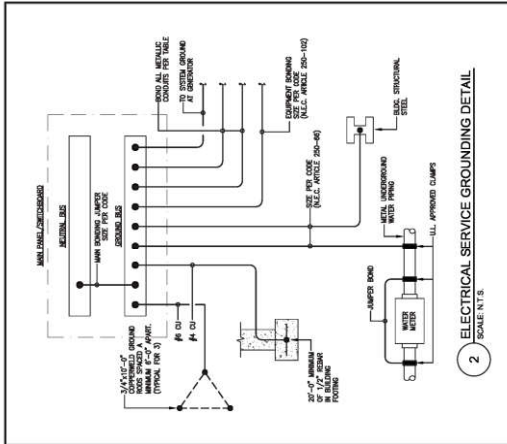
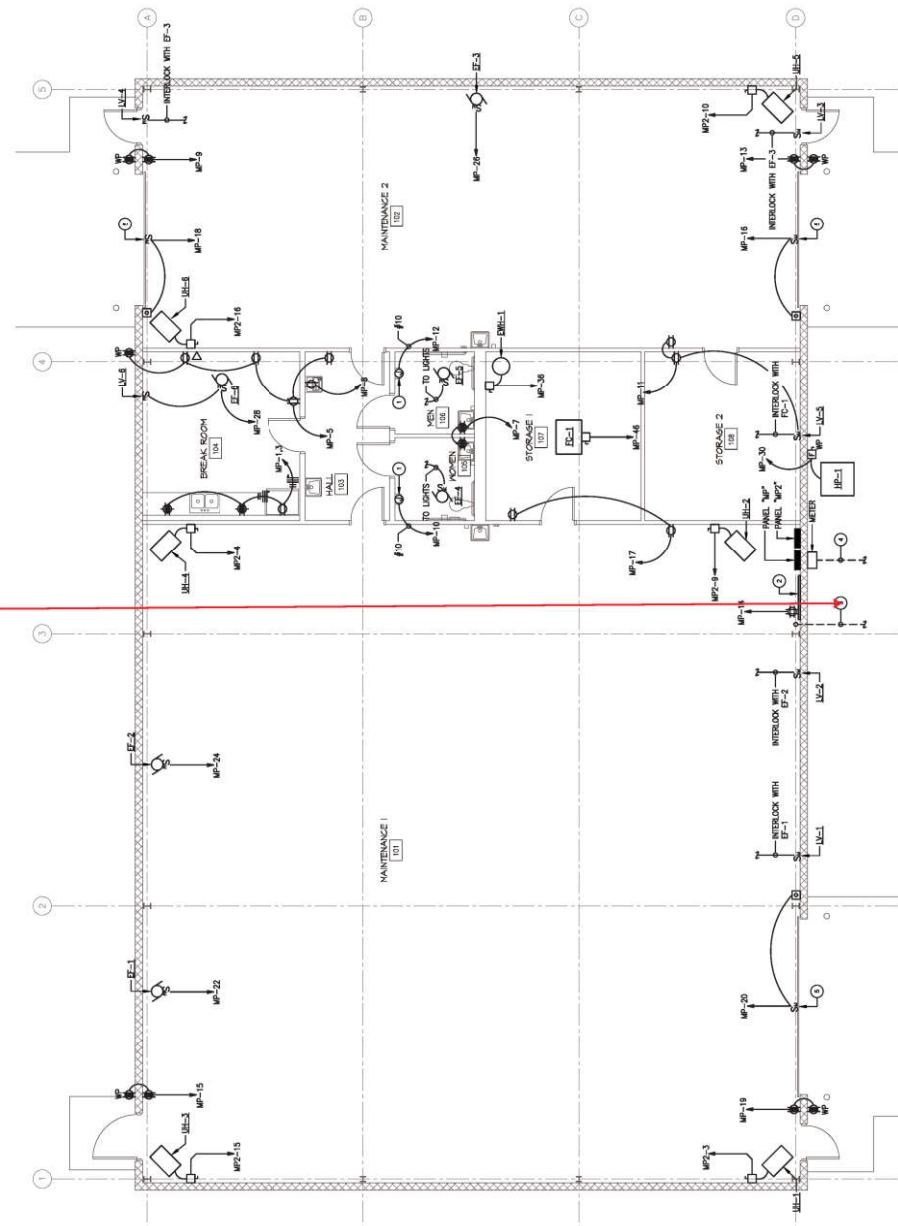
GENERAL NOTES:

- ALL WIRING SHALL BE 90°C (194°F) 250 VOLT, WITH VARIABLE COVER RATED, ITEM 1 FOR MOTOR USE AND ITEM 30 FOR OUTDOOR USE.
- WIRING SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ALL LOCAL ORDINANCES.
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NOTES (THIS SHEET ONLY)

- ELECTRIC WIRE SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ALL LOCAL ORDINANCES.
- TELEPHONE WIRING SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ALL LOCAL ORDINANCES.
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- TELEPHONE WIRING SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ALL LOCAL ORDINANCES.

Confirm this is required with Owner and it so, show on site plan.



1 ELECTRICAL FLOOR PLAN - POWER
 SCALE: N1:12

PERMIT PACKAGE

PROJECT MANUAL AND SPECIFICATIONS FOR:

COBB COUNTY PARKS MAINTENANCE BUILDING

**1792 COUNTY SERVICES PARKWAY
MARIETTA, GA 30008**



JOB NO.: 2209

SET NO.:

DATE: March 11, 2024

FOR PRICING

FOREMAN | SEELEY | FOUNTAIN

architecture

3091 GOVERNORS LAKE DRIVE. SUITE 150
PEACHTREE CORNERS, GEORGIA 30071
(770) 729-8433

Division 00 thru 48

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes. Concrete curbs, gutters, and walkways are included.
- B. See Division 32 00 00 Section 32 12 07 Aggregate Materials for drainage fill under slabs-on-grade.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Shop Drawings: For steel reinforcement.
- D. Material certificates.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment. All cement shall be provided by a single domestic manufacturer.
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete,"
 - 2. ACI 302.1 R "Guide for Concrete Floor and Slab Construction."
 - 3. ACI 304 "Guide for Measuring, Mixing, Transporting and Placing Concrete."
 - 4. ACI 318 "Building Code Requirements for Reinforced Concrete."
 - 5. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - 6. Concrete Reinforcing Steel Institute "Manual of Standard Practice.
 - 7. ASTM E 1155-96 "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System."
 - 8. ASTM 154-99 "Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs."
 - 9. ASTM E 1643-98 "Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under concrete slabs."
- C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Curves shall be uniform and free of form marks.
- D. Form Coatings: Use non-staining release agents approved by concrete manufacturer that will not discolor, deface, or impair finish or treatment of concrete.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
 - 1. Weldable Rebar: ASTM A 706
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets. Rolled fabric prohibited.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C or F, not to exceed 20% of cement content by weight. Do not use when ambient air temperatures are expected to be below 35 degrees F during the first 48 hours after placement. Do not use in mix designs where concrete will be exposed to view.
- B. Normal-Weight Aggregates: ASTM C 33.
 - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330.
- D. Water: ASTM C 94/C 94M and potable.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 VAPOR RETARDERS – See Section 07 26 00 – Vapor Retarders

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Curing and Sealing Compound shall be two coat type acrylic based, non yellowing and compatible with all floor finishes and adhesives. Do not install in areas to receive quarry tile, ceramic tile or porcelain tile. Use two coat, non-slip type, guaranteed for 5 years against dusting and chalking.
- E. Chemical Hardener: Colorless solution of magnesium fluosilicate, zinc fluosilicate and wetting agent containing not less than 2lb flusilicates per gallon.
 1. Acceptable products:
 - a. Sonneborn
 - b. Lapidolith
 - c. Dayton Superior
 - d. Day-Chem Hardener
- F. Water: Potable.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio:
 - a. Subject to freezing and thawing: 0.50.
 - b. Subject to deicers/watertight: 0.45
 3. Slump Limits at point of placement:

- a. Ramps and sloping surfaces: 3" max.
 - b. Reinforced foundation systems: Not less than 1" and not more than 4".
 - c. Slabs and other concrete: 4" max.
4. Air Entrainment: Use air-entraining admixture resulting in concrete with air content at point of placement as follows:
- a. Concrete exposed to freezing/thawing, deicer chemicals, or hydraulic pressure:
 - 1) 4.5% (moderate exposure); 5.5% (severe exposure) 1-1/2" max. aggregate
 - 2) 4.5% (moderate exposure); 6.0% (severe exposure) 1" max. aggregate
 - 3) 5.0% (moderate exposure); 6.0% (severe exposure) 3/4" max. aggregate
 - 4) 5.5% (moderate exposure); 7.0% (severe exposure) 1/2" max. aggregate
 - b. Other Concrete: 2% to 4% air.
5. Portland Cement Paving, Sidewalks and Curbs:
- a. 3,000 p.s.i. at 28 days curing.
 - b. Air Entrainment: 4% to 7%
 - c. Slump: 3"
 - d. Water/Cement Ratio: per article 2.7.B.2 above.

2.8 MISCELLANEOUS MATERIALS

- A. Non-slip Aggregate shall be "Alumogrit" aluminum filings.

2.9 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. Install clean, straight, solid surface and true to plane.
- C. Chamfer exterior corners and edges of permanently exposed concrete.
- D. Use earth forms only where earth is dry, stable and hidden from view.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Locate items as per approved submittals.

3.3 VAPOR RETARDERS

- B. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions. Refer to Section 07 26 00 – Vapor Retarder for installation instructions.
 - 1. Lap joints minimum 6 inches as per manufacturer's recommendations and seal with manufacturer's recommended tape.
 - 2. Protect from damage and punctures and repair all such damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
 - 2. For slabs on grade use reinforcing support to ensure proper clearance/cover. Do not pull reinforcing through placed concrete.
 - 3. Install materials and spacing's per approved submittals, discontinuous and held back from joints as required. Set and secure to required clearances from earth and form work.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete. Locate as per approved submittals.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, sprinkler mains, drain piping, and immovable objects.
- E. Site Concrete: at concrete pavements and curbs, provide contraction joints at 12' o.c. maximum. Joint patterns in pavements and sidewalks shall be generally square. At curbs

provide full depth expansion joints at 20' o.c. maximum. At sidewalks, provide weakened plane contraction joints not more than 5'-0" max. and expansion joints at 20 feet o.c. maximum. Tool all edges. Install self-leveling sealant at all isolation/expansion joints.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Protect adjacent finishes and materials from splatters.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301. Contractor shall maintain spare vibrator on site during all placement.
- C. Place concrete in/on properly prepared sub-base or forms. Place concrete slabs directly on water vapor retarder. Provide not less than 6" of prepared granular sub-base between water vapor retarder and ground.
 - 1. Install water vapor retarder in compliance with ASTM E 1643.
 - 2. Lap joints 6 in. and seal with manufacturers adhesive or tape.
 - 3. Seal around all penetrations with manufacturers pipe boot or by wrapping with vapor retarder and taping.
 - 4. Repair all punctures and cuts using vapor retarder material lapped 6 inches beyond damaged area and taped.
- D. Cold-Weather Placement: Comply with ACI 306.1.
- E. Hot-Weather Placement: Comply with ACI 301.
- F. Do not place concrete on/in frozen sub-base or forms.
- G. Pumping Concrete: Concrete may be placed by pumping if first approved in writing by the Architect/Engineer of record. Pumped concrete shall only be placed in the presence of the Testing/Inspecting Agent.
 - 1. Equipment: Pumping equipment shall be of the size and design that ensures a continuous flow of concrete at the delivery end without separation of materials. Do not pump concrete through aluminum pipes.
 - 2. Concrete mix: Shall conform to the project specifications, except that mix may contain chemical admixtures to allow proper pumping. Include the specified high-range or mid-range water reducing admixture in the mix. Unless strictly controlled and anticipated in the development of the design mix, the addition of admixtures at the jobsite shall be prohibited.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.

- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Float slabs with a highway straight edge in lieu of a conventional bull float. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces to all interior slabs, including slabs to receive VCT, rubber flooring, entry tiles, carpet, concrete sealer and similar finishes.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated, perpendicular to traffic. Tool all edges to 1/2" radius unless noted otherwise.
- E. Apply concrete hardener to exposed interior floors and exterior slab at recessed entrance.
- F. Floors to receive resilient flooring shall limit moisture vapor emission to not more than 3 pounds per 1,000 square feet per 24 hours, in compliance with ASTM F-1869.
- G. Provide a floor surface which is true and level and achieves "F Numbers" of $F_F = 40$ and $F_L = 30$ minimum overall composite and $F_F = 20$ and $F_L = 15$ minimum at any individual section, when tested in accordance with ASTM E 1155. Remove surface irregularities to provide a continuous smooth finish.
- H. Repair or replace broken, defective and stained concrete, and replace non-conforming concrete, all as directed by owner.
- I. Install non-slip aluminum grit to exterior steps and ramps. Apply at 25 pounds per 100 square feet and work evenly into surface.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval. Accomplish immediately after form removal by working in slurry from adjacent concrete to maintain homogenous mix and uniform coloration.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Employ at the owner's expense, a testing laboratory, acceptable to owner, to perform concrete testing as described in paragraph 1.6 of Section 01400, Testing Laboratory Services. Any variation from Section 01400 must be approved in advance by the Architect.
- B. Testing:
 - 1. All performed by an independent testing laboratory.
 - 2. All (except retests and "false start calls") shall be paid by Owner; Contractor to pay for exceptions. Lab to invoice separately.

3. Architect will obtain proposals for testing services and make a recommendation to the Owner. Owner will approve the services of a testing laboratory and the Architect will contract for the services, within 10 days after Owner's "Notice of Award" to Contractor.
 4. Contractor Duties: Notify Lab prior to concrete placements; give Lab at least 24 hours notice.
 5. Lab Duties: Make cylinders, date, identify placement locations, store for lab pick-up. Retrieve cylinders from site, test, and provide written report to CCSD Project Manager, the A./E, the Contractor, and the concrete supplier. Immediately after testing, notify all parties of any low break, results by FAX transmittal.
 6. Lab Invoicing: Lab to send invoice with required back-up to A/E for endorsement; A/E forwards to Owner with recommendation for payment.
- C. Concrete not conforming to requirements of construction documents or which fails required Quality Assurance testing, including Flatness/Levelness requirements, shall be removed and replaced at owner's discretion.

3.12 ALLOWABLE TOLERANCES IN EXPOSED FINISHED WORK:

- A. In Linear Building Lines, Elevation and Conspicuous Lines and Arises: Maximum 3/16" in 20'-0"; maximum 3/8" in 40'-0" or more.
- B. In Cross-Sectional Dimension: 3/16".
- C. In surface Plane, Plumb and Level: 1/8" in 10'-0" in any direction when measured with a 10'-0" straight edge.

END OF SECTION 03 30 00

SECTION 04 05 13 – MASONRY MORTARING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Furnish labor, equipment and materials to install unit masonry mortar.

1.2 QUALITY CRITERIA:

- A. Unless specifically specified otherwise, all quality control recommendations of the Brick Institute of America, Technical Notes, latest edition shall be adhered to as though incorporated herein.
- B. Only one brand of masons cement shall be used throughout the project.

1.3 SUBMITTALS:

- A. Submit manufacturer's product specifications and mixing and installation instructions for each manufactured product.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver manufactured materials in original unopened containers displaying product name, type, grade and where applicable, mixing instructions.
- B. Store materials to prevent inclusion of foreign materials and cover to protect from moisture and contamination.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Prepared masonry cement shall be premixed and shall meet the requirements of ASTM C91 for type S mortars and Type N mortars.
- B. Aggregate for mortar shall be clean, hard, natural washed sand meeting ASTM C144.
- C. Portland cement shall meet requirements of ASTM C-150.
- D. Water shall be clean, potable and free from deleterious amounts of alkalis, acids and organic materials.
- E. Provide integral water reducing and plasticizing admixture for all exterior applications.
- F. No anti-freeze admixtures will be allowed.

2.2 PROPORTIONS:

- A. Proportion materials by volume in accordance with the following requirements of ASTM C-270.
1. Type S Mortar
 - One part masonry cement

 - One-half part portland cement
 - Four and one-half parts sand
 - OR
 - One part masonry cement Type S
 - Three parts sand

2.3 COLOR:

- A. Submit full range of colors for selection by Architect.

PART 3 - EXECUTION

3.1 MIXING:

- A. Mix mortar in power-driven, drum type mixers. Mix mortar minimum of five minutes after addition of all materials.

3.2 PLACING MORTAR:

- A. Placement of mortar shall be in accordance with the unit masonry sections of these specifications.
- B. Schedule of mortar type usage:
1. Type S: Reinforced C.M.U. walls.
 2. Type N: Veneers and unreinforced partition walls.
- C. Retemper mortar as necessary to keep plastic. Use no mortar after setting has begun or after 2-1/2 hours of initial mixing.

END OF SECTION 04 05 13

SECTION 04 22 23.29 – REINFORCED SPLIT - FACE CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units (CMUs) reinforced and filled with grout as shown on structural drawings.
- B. See Division 5 Section "Metal Fabrications" for furnishing steel lintels for unit masonry.
- C. See Division 7 Section "Sheet Metal Flashing and Trim" for furnishing manufactured reglets installed in masonry joints for metal flashing.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
- C. Samples for each type and color of exposed masonry units and colored mortars.
- D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
 - 1. For masonry units include material test reports substantiating compliance with requirements.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.3 QUALITY ASSURANCE

- A. Preconstruction Testing Service: At the Owner's expense, engage a qualified independent testing agency to perform preconstruction testing indicated below.
 - 1. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
 - 2. Mortar Test (Property Specification): For each mix required, per ASTM C 780.
 - 3. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019.
- B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
- C. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Build sample panels as required by architect.

1.4 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 COLORS, TEXTURES, AND PATTERNS

- A. Exposed Masonry Units: As selected from manufacturer's full range.

2.2 CONCRETE MASONRY UNITS (CMUs)

- A. Shapes: Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. Integral Water Repellent: Provide units made with liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength for exposed units.
- C. Concrete Masonry Units: ASTM C 90.
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
 2. Pattern and Texture for Decorative Units: as required by architect.

2.3 MASONRY LINTELS

- A. Masonry Lintels: Made from u shaped bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Masonry Cement: ASTM C 91.
- D. Mortar Pigments: Iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

- E. Aggregate for Mortar: ASTM C 144.
 - 1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- F. Aggregate for Grout: ASTM C 404.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
- I. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615 Grade 60 or ASTM A 706 (Weldable).
- B. Masonry Joint Reinforcement: ASTM A 951; mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls.
 - 1. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
 - 2. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
 - 3. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
 - 4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 5. Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
 - 6. Multiwythe Masonry:
 - a. Adjustable (two-piece) type, with one side rod at each face shell of backing wythe and with ties that extend into facing wythe. Ties engage eyes or slots in reinforcement and extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous wire in the facing wythe.

2.6 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement and lime.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification.

See Section 04100 - Mortars
- C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
- C. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.

3.2 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- E. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.3 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.

3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
 - C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
 - D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.4 MASONRY JOINT REINFORCEMENT

- A. General: Install in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.5 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated.
 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.6 REINFORCED UNIT MASONRY INSTALLATION

- A. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.7 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
 - 1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
- B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.
- E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780.
- F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.8 CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Protect adjacent surfaces from contact with cleaner.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.9 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
 - 2. Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04200

SECTION 05 50 00 - METAL FABRICATIONS

1.0 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 DESCRIPTION OF WORK:

- A. DEFINITION: Metal fabrications specified in this section include steel items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of other metal systems specified under other sections.
- B. Extent of metal fabrications is indicated on drawings and provisions of this section.
- C. Types of work in this section include:
1. Rough Hardware
 2. Miscellaneous Framing and Supports
 3. Shelf Angles
 4. Steel Railings
 5. Cast Iron Downspout Boots
- D. Work specified in other sections include:
1. Structural steel
 2. Steel joists and metal deck
 3. Sheet metal, Flashing, Metal Fascia & Copings.

1.3 SYSTEM PERFORMANCES:

Structural Performances: Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

1. Handrails and Toprails: Capable of withstanding the following loads applied as indicated when tested per ASTM E 935.
 - a. Concentrated Loads of 200 lbs. applied at any point in any direction.
 - b. Uniform load of 50 lbs. per linear foot applied simultaneously in both vertical and horizontal directions.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
2. Guards: Intermediate rails, balusters and panel fillers capable of withstanding a uniform load of 25 lbs. per sq. ft. of gross area of guard, including any open areas, of which they are a part.

Above load need not be assumed to be acting concurrently with uniform horizontal loads on top rails of railing assembly in determining stress on guard supporting members.

1.4 QUALITY ASSURANCE:

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

1.6 PROJECT CONDITIONS:

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

2.0 PRODUCTS

A. Ferrous Metals:

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Steel Plates, Shapes and Bars: ASTM A 36.

3. Steel Bar Grating: ASTM A 569 or ASTM A 36.

4. Steel Tubing: Cold-formed ASTM A 500, or hot-rolled ASTM A 501.

5. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.

6. Galvanized Structural Steel Sheet: ASTM A 446, of grade required for design loading. Coating designation as indicated, or if not indicated G90.

7. Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

8. Gray Iron Castings: ASTM A 48, Class 30.

9. Malleable Iron Castings: ASTM A 47, Grade as selected by fabricator.

10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

11. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

B. Grout:

Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

Approved Manufacturers:

1. B-6 Construction Grout; W.R. Bonsal Co.
2. Diamond-Crete Grout; Concrete Service Materials Co.
3. Sure-grip High Performance Grout; Dayton Superior Corp.
4. Euco N-S Grout; Euclid Chemical Co.
5. Five Star Grout; Five Star Products
6. Vibropruf #11; Lambert Corp.
7. Masterflow 928 and 713; Master Builders Technologies, Inc.
8. Sealtight 588 Grout; W.R. Meadows, Inc.
9. SonogROUT 14; Sonneborn Building Products – ChemRex, Inc.

C. Fasteners:

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
3. Lag Bolts: Square head type, FS FF-B-561.
4. Machine Screws: Cadmium plated steel, FS FF-S-92.
5. Wood Screws: Flat head carbon steel, FS FF-S-111.
6. Plain Washers: Round, carbon steel, FS FF-W-92.
7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
9. Lock Washers: Helical spring type carbon steel FS FF-W-84.

D. Paint:

1. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and

for capability to provide sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS TT-P-645.

2. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20
3. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

E. Concrete Fill:

1. Concrete Materials and Properties: Comply with requirements of Division-3 section "Concrete Work" for normal weight, ready-mix concrete with minimum 28-day compressive strength of 3000 psi, 440 lbs. cement per cu. ft. minimum and W/C ratio of 0.65 maximum, unless higher strengths indicated.
2. Non-Slip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rust-proof and non-glazing; unaffected by freezing, moisture or cleaning materials.

2.1 FABRICATION, GENERAL:

A. Workmanship: Use of materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.

B. Form exposed work true to line and level with accurate angles and surfaces and straight shape edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts.

E. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

F. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

G. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates,

bars and strip 1/8" thick and heavier.

3. ASTM A 386 for galvanizing assembled steel products.

H. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

I. Shop Painting:

1. Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. I" for shop painting.

2. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."

Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

2.2 ROUGH HARDWARE:

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division-6 sections.

B. Fabricate items sizes, shapes and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.3 MISCELLANEOUS FRAMING AND SUPPORTS:

A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.

B. Fabricate Miscellaneous Units to sizes, shapes, and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes, plates and 7 steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

2.4 SHELF ANGLES:

Provide structural steel shelf angles of sizes indicated.

2.5 STEEL PIPE RAILINGS AND HANDRAILS:

A. Fabricate steel pipe railings, and handrails to design, dimensions, and details indicated. Provide railings and handrails members formed of pipe of sizes and wall thickness indicated, but not less than that required to support design loading.

B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

At tee and cross intersections provide coped joints.

At bends interconnect pipe by means of prefabricated elbow fittings or flush radius bends, as applicable, of radiuses indicated.

Form bends by use of pre-fabricated elbow fittings and radius bends or by bending pipe, at fabricator's option.

C. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of pipe.

D. Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.

E. Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings.

F. Brackets, Flanges, Fittings and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for interconnections of pipe attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work. Furnish back-up steel plates in metal stud walls for anchorage of handrail brackets in stairs.

For railing posts sets in concrete, provide sleeves of galvanized steel pipe not less than 6" long and with an inside diameter not less than 1/2" greater than the outside diameter of pipe. Provide steel plate closure welded to bottom of sleeve and of width and length not less than 1" greater than outside diameter of sleeve.

2.6 Metal Stairs

A. Stair Framing:

1. Fabricate stringers of steel channels unless noted otherwise.
2. Provide closures for exposed ends of channel stringers.
3. Construct platforms of steel channel headers and miscellaneous framing members as needed to comply with performance requirements.
4. Weld stringers to headers; weld framing members to stringers and headers.
5. Provide stiffeners inside stringers at all posts.

B. Metal-Pan Stairs: Form risers, subread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.0677 inch.

1. Steel Sheet: Uncoated cold-rolled steel sheet, unless otherwise indicated.
2. Directly weld metal pans to stringers; locate welds on top of subreads where they will be concealed by concrete fill. Do not weld risers to stringers.
3. Shape metal pans to include nosing integral with riser.

4. Attach abrasive nosings to risers.
- 2.7 Cast Iron Down Spout Boots (factory painted dark Bronze brown)
Approved Manufacturers:
 - a. Berry Pattern & Foundry, Birmingham, AL
 - b. Jay R. Smith Mfg. Co., Montgomery, AL
 - c. J. R. Hoe & Sons, Louisville, KY
 - 2.8 Flexible coupling (connecting U.S. boot to pipe)
Approved Manufacturers:
 - a. Fernco
 - b. Metraflex
 - c. MiFab, Inc.
 - 3.0 EXECUTION
 - 3.1 PREPARATION:
 - A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progresses; allow for trimming and fitting where taking field measurements before fabrication might delay work.
 - B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
 - 3.2 INSTALLATION:
 - A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lab bolts, wood screws and other connectors as required. Provide steel or wood blocking in metal stud walls for handrail anchorage.
 - B. Cutting, Fitting, and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plus, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.
 - C. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
 - D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
 - E. Steel Pipe Railings and Handrails:

1. Adjust railing prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
 - a. Anchor posts in concrete means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.
 - b. Leave anchorage joint exposed; wipe off excess grout and level 1/8" build-up, sloped away from post. For installation exposed on exterior or to flow of water, seal grout to comply with grout manufacturer's directions.
 - c. Anchor posts to steel, or with steel oval flanges, angle type floor type as required by conditions, welded to posts and welded to steel supporting members.
 - d. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
 - e. Anchor rail ends to steel with steel oval or round flanges welded to rail ends and welded to structural steel members.
2. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows.:
 - a. For metal stud walls, anchor with bolts to steel "blocking" in wall.
 - b. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.

3.3 ADJUST AND CLEAN:

- A. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in Division-9 of these specifications.
- B. For Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 06 10 00 - ROUGH CARPENTRY

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Definition: Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated. Types of work in this section include rough carpentry for: Wood grounds, nailers, blocking and sleepers; plywood sheathing; plywood subflooring.

1.3 REFERENCES:

A. Lumber Standards: Comply with PS 20-70 and with applicable rules of the respective grading and inspecting agencies for species and products indicated.

B. Plywood Product Standards: Comply with PS 1 (ANSI A 199.1) or, for products not manufactured under PS 1 provisions, with applicable APA Performance Standard for type of panel indicated.

1.4 PRODUCT HANDLING:

Delivery and Storage: Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood, and provide air circulation within stacks.

1.5 JOB CONDITIONS:

Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

2.0 PRODUCTS:

2.1 MATERIALS:

A. Lumber, General:

1. Factory-mark each piece of lumber with type, grade, mill and grading agency.
2. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
 - a. Provide dressed lumber, S4S unless otherwise indicated.
 - b. Provide seasoned lumber with 19% maximum moisture content at time of dressing.

3. Framing Lumber (2" through 4" thick) (Wd-Frm): For light framing (less than 6" wide) provide the following grade and species: Utility grade, any species.

B. Miscellaneous Lumber:

1. Provide wood for support or attachment of other work including cant strips, bucks, nails, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:

Moisture content: 15% maximum for lumber items not specified to receive wood preservative treatment.

2. Grade: Construction Grade light framing size lumber of any species or board size lumber as required. Provide construction grade boards (RIS or WCLB) or No. 2 boards (SPIB or WWPA).

C. Plywood (PWD):

1. Trademark: Identify each plywood panel with appropriate APA trademark.

2. Concealed Performance-Rated Plywood: Where plywood panels will be used for concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.

3. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated, or, if not otherwise indicated not less than 1/2".

4. Painted Plywood: Where indicated to receive paint finish, all plywood to be medium density overlay.

D. Miscellaneous Materials:

Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use, including recommending nails.

Where rough carpentry work is exposed to weather in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).

Building Paper: Asphalt saturated felt, non-perforated, ASTM 226.

E. Wood Treatment:

Preservative Treatment: Where lumber or plywood is indicated as "TRT-Wd" or "Treated" or is specified herein to be treated, comply with applicable requirements of AWPB Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.

Pressure-treat above-ground items with water-borne preservatives complying with AWPB LP-2. After treatment, kiln dry to a maximum moisture content of 15%. Treat indicated items and the following:

- a. Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
 - b. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
 - c. Wood framing members less than 18" above grade.
 - d. Use in contact with masonry, steel, concrete, and/or roofing system.
- F. Fire-Treated Wood: Use above ceilings and/or within fire rated enclosures and where shown. Maximum 25 flame spread per ASTM E-84. Isolate from contact with metal items and masonry.

3.0 EXECUTION

3.1 INSTALLATION

A. General:

1. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
2. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.
3. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards and within 3" of member ends. Countersink nail heads on exposed carpentry work and fill holes.

Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

B. Wood Grounds, Nailers, Blocking and Sleepers:

1. Provide wherever shown and where required for screening or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise shown. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
3. Provide permanent grounds of dressed, preservative treated, keybevelled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

4. Leave 1/2" spaces between ends of abutting wood blocking around roof perimeter for ventilation.

END OF SECTION 06 10 00

SECTION 06 41 00 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Special fabricated cabinet units.
 - 2. Countertops.
 - 3. Shop finishing.
 - 4. Cabinet hardware.
- B. Related Sections:
 - 1. Division 01: Administrative, procedural, and temporary work requirements.
 - 2. Section 07 92 00 - Joint Sealants.

1.2 REFERENCES

- A. Architectural Woodwork Institute (AWI) - Architectural Woodwork Quality Standards.
- B. Association of Electrical and Medical Imaging Equipment Manufacturers (NEMA) LD-3 - High Pressure Decorative Laminates.
- C. Forest Stewardship Council (FSC) STD-40-004 - Chain of Custody Standard.

1.3 SUBMITTALS

- A. Submittals for Review:
 - 1. Shop Drawings:
 - a. Include dimensioned plan, sections, elevations, and details, including interface with adjacent work.
 - b. Designate wood species and finishes.
 - 2. Samples:
 - a. Minimum 1 1/2" x 2 1/2" plastic laminate samples showing available colors and finishes.
 - b. Each hardware component.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications:
 - 1. Minimum 5 years documented experience in work of this Section.
 - 2. Certified under AWI Quality Certification Program.
- B. Mockup:
 - 1. Size: Base and wall cabinet, minimum 24 inches wide.
 - 2. Show: Cabinets, countertops, and hardware.
 - 3. Deliver to Architect for approval.
 - 4. Approved mockup may not remain as part of the Work.
- C. Pre-Installation Conference:
 - 1. Convene 3 weeks prior to beginning work of this Section.
 - 2. Attendance: Architect, Owner, Contractor, installer, and related trades.

3. Review, discuss and resolve:
 - a. Critical dimensions.
 - b. Product delivery and storage.
 - c. Staging and sequencing.
 - d. Protection of completed work.

1.5 DELIVERY, STORAGE AND HANDLING

- D. Do not deliver materials until proper protection can be provided, and until needed for installation.

1.6 PROJECT CONDITIONS

- E. Environmental Requirements: HVAC system complete and operational for minimum 10 days prior to installation of cabinets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers - Plastic Laminate:
 1. Formica Corp. (www.formica.com)
 2. Nevamar Co. (www.nevamar.com)
 3. Wilsonart International, Inc. (www.wilsonart.com)

- B. Acceptable Manufacturers – Solid Surface
 1. DuPont Corian
 2. Wilsonart Solid Surface
 3. Formica Solid Surface

- C. Substitutions: Under provisions of Division 01.

2.2 MATERIALS

- A. Panel Products:
 1. Graded in accordance with AWI Section 200 requirements for quality grade specified.
 2. Panel core: Medium density fiberboard.

- B. Hardboard: Pressed wood fiber with resin binder; tempered grade, 1/8 inch thick, smooth one side.

- C. Plastic Laminate: NEMA LD-3.
 1. Horizontal surfaces:
 - a. Backing sheet: Grade BGF.
 - b. Postformed surfaces: Grade HGP.
 - c. Acid resisting: Grade LGP.
 - d. Other surfaces: Grade HGS.
 2. Vertical surfaces:
 - a. Backing sheet: Grade BLF.
 - b. Other surfaces: Grade VGP.
 3. Melamine laminate: Grade VGL.
 4. Colors: To be selected from manufacturer's full color range.
 5. Finish: Matte or Gloss.

- D. Lumber:
 - 1. Graded in accordance with AWI Section 100 requirements for quality grade specified, average moisture content of 6 percent.

2.3 SOLID SURFACE COUNTER TOPS

- A. Provide solid surface material as manufactured by one of the following:
 - 1. DuPont Corian.
 - 2. Wilsonart Solid Surface.
 - 3. Formica Solid Surfacing.
- B. Minimum thickness to be ½ inch.
- C. Edges to be solid full rounded as shown on drawings.

2.4 ACCESSORIES

- A. Fasteners: Type and size as required by conditions of use.
- B. Adhesives:
 - 1. Waterproof, water based or solvent release type, compatible with backing and laminate materials.
- C. Joint Sealants: Specified in Section 07 92 00.

2.5 HARDWARE:

- A. Hardware:
 - 1. Hinges:
 - a. 5-Knuckle Hinges / Reveal Overlay: Standard: Hinges shall be stainless steel: .095" thick steel five-knuckle hospital-tip, institutional Grade (Grade 1 per ANSI/BHMA A156.9) quality with .187" diameter tight pin. Each hinge shall be secured with a minimum of nine No. 8 screws. Hinge shall permit door to swing 270 degrees without binding. Doors less than 48" in height shall have two hinges. Doors over 48" in height shall have three hinges.
 - 2. Pulls:
 - a. One pull shall be: located at the centerline of the drawer, regardless of width, to ensure ease of operation and maximize drawer slide life.
 - 1. Standard: Stainless steel wire pull, 8mm diameter with 96mm O.C. mounting holes.
 - 3. Drawer Slides:
 - a. Standard drawer: Self-closing, bottom mount epoxy coated with captive roller and positive in stop. Slide shall have 100 lb. load rating, must be: self-closing and must prevent drawer fronts from contacting the cabinet body. Drawer slides must meet or exceed Grade 1 requirements per ANSI A156.9/BHMA with full extension slides on file and paper storage.
 - 4. Catches:
 - a. Roller Catch, (not used with self-closing hinges) shall have: heavy-duty,

- spring-loaded roller, with molded plastic bumper mounted at door top to keep door securely shut.
- b. Magnetic Catch, (not used with self-closing hinges) shall have: white plastic housing with two 32mm spaced, elongated holes for screw-attachment to allow adjustability.
- c. Catches shall be: Standard: Magnetic at Base and Wall, 2 Roller at Tall

2.6 FABRICATION

- A. Cabinets - Plastic Laminate Finish:
 - 1. Quality: AWI Section 400, Custom Grade.
 - 2. Type: Reveal overlay with 5/8 inch horizontal and vertical reveals.
 - 3. Semi-exposed surfaces: Melamine laminate.
 - 4. Fit exposed and semi-exposed panel edges with matching edging.
 - 5. Fabricate drawer bodies to full depth of drawer fronts less 1/2 inch.
- B. Plastic Laminate Countertops:
 - 1. Quality: AWI Section 400, Custom Grade.
 - 2. Fabricate from panel product with lumber fronts.
 - 3. Locate end joints centered or symmetrical. Join sections with concealed clamp fasteners. Locate plastic laminate butt joints minimum 2 feet away from sinks.
 - 4. Provide holes and cutouts for mounting of sinks, trim, and accessories.
- C. Shop assemble for delivery to project site in units easily handled.
- D. Prior to fabrication, field verify dimensions to ensure correct fit.
- E. Apply plastic laminate in full uninterrupted sheets; fit corners and joints to hairline. Slightly bevel arises. Apply laminate backing sheet to reverse side of laminate faced surfaces.
- F. Where field fitting is required, provide ample allowance for cutting. Provide trim for scribing and site conditions.
- G. Provide cutouts and reinforcement for plumbing, electrical, appliances, and accessories. Prime paint surfaces of cut edges.

PART 3 EXECUTION

3.1 PREPARATION

- A. Prior to installation, condition cabinets to average humidity that will prevail after installation.

3.2 INSTALLATION

- A. Install in accordance with AWI Section 1700, [Premium] [Custom] [Economy] Grade requirements.
- B. Set plumb, rigid and level.
- C. Scribe to adjacent construction with maximum 1/8 inch gaps.
- D. Adhere countertops, splashes, and skirts with beads of adhesive.
- E. Fill joints between tops and splashes with sealant as specified in Section 07 92 00; finish flush.

END OF SECTION 06 41 00

SECTION 7 19 13 – ACRYLIC WATER REPELLENT

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SECTION INCLUDES:

Installation of CLEAR PENETRATING SEALER on exterior masonry and cast-in place concrete floor surfaces, or where indicated on drawings, consisting of preparation of existing and new surfaces.

1.3 RELATED SECTIONS

- A. Section 04 22 23 – Reinforced Split – Face Concrete Unit Masonry
- B. Section 07 92 00 – Joint Sealants: Coordination for compatibility

1.4 REFERENCES

- A. ASTM C 140 - Methods for Sampling and Testing Concrete Masonry Units
- B. ASTM E 96 - Test Methods for Water Vapor Transmission of Materials
- C. ASTM E 514 - Standard Test Method for Water Penetration and Leakage Through Masonry
- D. ASTM G 53 - Standard Practice for Operating Light- and Water-Exposure Apparatus for Exposure of Nonmetallic Materials

1.5 SYSTEM DESCRIPTION

Product provided by this Section CLEAR PENETRATING SEALER is a concentrated, water dilutable, VOC compliant, breathable, water repellent protectant for use on brick and other masonry and will not harm vegetation and glass. Products listed as approved do not have these same features but may be used if proper precautions are taken.

1.6 SUBMITTALS

- A. General: Submit in accordance with Section 01 30 00.
- B. Product Data: Submit manufacturer's product literature and installation instructions.
- C. Samples: Submit samples of concrete masonry units approved for use in Project with water repellent treatment applied to half of each sample face; indicate which half has been coated.
- D. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.8.

1.7 QUALITY ASSURANCE

- A. Applicator Qualifications: Applicator shall be experienced in applying the same or similar materials and shall be specifically approved in writing by the membrane manufacturer.

- B. Regulatory Requirements: Comply with applicable codes, regulations, ordinances, and laws regarding use and application of products that contain volatile organic compounds (VOC).
- C. Pre-Application Conference: Prior to beginning work, convene a conference to review conditions, installation procedures, schedules and coordination with other work.

1.8 WARRANTY

- A. Special Warranty: Provide for correcting failure of water repellent treatment to resist penetration of water.
 - 1. Warranty Period: Five years.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.
 - 1. Name of material.
 - 2. Manufacturer's stock number and date of manufacture.
 - 3. Material safety data sheet.
- B. Store material under shaded area away from direct sunlight between 40°F to 110°F. Keep away from heat, ignition/sparks and from rain/standing water. Prevent the product from freezing. Keep the container of CLEAR PENETRATING SEALER tightly closed after every withdrawal (product can start reacting with moisture in the ambient air) when not in use.

1.10 PROJECT CONDITIONS

- A. Do not apply CLEAR PENETRATING SEALER when temperatures are expected to fall below 40° F (4° C) within 12 hours or when rain is expected within 4 hours following the application.
- B. Coordinate installation work with other trades. The applicator shall have sole right of access to the specified areas for the time needed to complete the application.
- C. Warn personnel against contact of material eyes. Wear applicable protective clothing and respiratory protection gear.
- D. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide products manufactured and supplied by Carlisle Coatings and Waterproofing Incorporated, 900 Hensley Lane, Wylie Texas 75098, phone (800) 338-8701, fax (972) 442-0076.
- B. The products listed below are approved as equal to Clear Penetrating Sealer by Carlisle provided a 5 year warranty is available as per paragraph 1.8 of this section. These products have different characteristics than Carlisle Sealer and can be highly caustic and will damage aluminum, coated steel, glass and other building materials. Masking of adjacent surfaces is mandatory. These products will damage landscaping and must be applied prior to any grass or landscape installation.

1. Sure Klean Weather Seal
Prosoco, Inc.
3741 Greenway Circle
Lawrence, KS 66046
(800) 255-4255
2. TVIS Penetrating Masonry Sealer
Custom Building Products
1301 Seal Beach Boulevard
Seal Beach, CA 90740
(800) 272-8786

2.2 PRODUCTS

A. MATERIALS

1. CLEAR PENETRATING SEALER: Shall be breathable, water-based, VOC compliant, penetrating sealer which reacts chemically with the substrate to form a long-lasting, water-repellant surface.
 - a. Clear, non-yellowing water repellent treatment shall not alter appearance, color, or texture of substrate under any lighting conditions.
 - b. Shall be compatible with glass and protection not required.
 - c. Shall be compatible with landscaping/vegetation and protection not required.
 - d. Shall be compatible with sealants and joint sealers and protection not required.

3.1 INSPECTION

- A. Before any water repellent work is started the Contractor and the applicator shall thoroughly examine all masonry surfaces for any deficiencies. Should any deficiencies exist, the architect shall be notified in writing and corrections made.

3.2 PREPARATION

A. Protection:

1. Sealant Coordination: Compatible with all sealants and no protection or coordination required.
2. Protection of glass, glazed products, and prefinished products from contact with CLEAR PENETRATING SEALER is not required. Will not harm surfaces.
3. Protection of landscape materials from contact with CLEAR PENETRATING SEALER is not required. Will not harm vegetation.
4. Protect concrete walks.
5. Follow manufacturer's written recommendations for protection of other surfaces and landscaping for other approved products.

B. Surface Preparation: Prepare substrates in accordance with CLEAR PENETRATING SEALER manufacturer's recommendations.

1. Clean surfaces by removing all the loose cement mortar.
2. Clean surfaces of dust, dirt and foreign matter detrimental to proper installation of water repellent treatment and clean the dust using a non-compressed air blower or industrial vacuum cleaner followed by low pressure water application.

C. Preparation:

1. Test Application: Prior to performance of water repellent work, including bulk purchase/delivery of products, prepare a small application in an unobtrusive location (minimum 20 square feet) and in a manner acceptable to Architect, for purpose of demonstrating final effect (visual and physical/chemical) of planned installation. Proceed with work only after Architect's acceptance of test application, or as otherwise directed.
 - Brick Cleaning shall be complete, observed and acceptable by the Architect before start of water repellent work. Application prior to Architect's authorization may result in the necessity of removal of coating at Contractor's expense and reapplication after surface has been made acceptable.
 - Revision of planned installation, if any and as requested by Architect, will be by change order where it constitutes a departure from requirements of contract documents at time of contracting.
2. Clean Substrate of substances which might interfere with penetration / adhesion of water repellents. Test for moisture content, in accordance with repellent manufacturer's instructions, to ensure that surface is sufficiently dry.

3.3 APPLICATION

- A. Add sealer concentrate to water and mix.
 1. CLEAR PENETRATING SEALER should be diluted with potable water (TDS below 1000 ppm) to obtain clear transparent solution.
 2. CLEAR PENETRATING SEALER solution (1:20) is made by adding 1 liter CLEAR PENETRATING SEALER in 5 gallons of water or 20 liters to 100 gallons of potable water. In the document hereafter, diluted CLEAR PENETRATING SEALER solution will mean the dilution ratio unless specified otherwise.
 3. CLEAR PENETRATING SEALER is best applied at ambient temperatures of 40°F to 110°F.
- B. Apply to wall using low-pressure non-atomizing spray.
 1. Spray until saturated; no run down requirement
 2. Pot life: 24 hours once mixed
 3. Coats required: One application

3.4 INTEGRITY TESTING

- A. Test two (2) locations to be designated by Architect. Additional testing will be by change order, unless in the Architect's opinion, the first two tests fail by allowing moisture to be absorbed into wall.
- B. Test is required for all integrity testing required by architect or owner and for expanded warranties beyond the standard 5 year material warranty. Architect shall be present for tests.
- C. The test can be done using the RILEM Test.
 1. RILE M Test Method II.4 is for measuring the volume of water absorbed by a material within a specified time period. The test can be performed at the site for vertical or horizontal surfaces. It simulates pressure created by wind-driven rain of 85mph.
 - a. Affix the bottom end of the tube on the masonry surface with clay or putty. Apply manual pressure to ensure adhesion.
 - b. Add water through the upper, open end of the pipe using long pipette to prevent any air bubbles in the tube until the column reaches the zero graduation mark.

- c. After 20 minutes, check the quantity of water absorbed by the material in a specified time (20 minutes). This can be read directly from the graduated tube.

3.5 CLEANING

- A. Should glass cleaning be required, use a product containing nonionic cleaners

END OF SECTION 07 19 13

SECTION 07 26 00 - VAPOR RETARDERS

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-I Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of vapor retarder work is indicated on drawings and provisions of this section.

Where drawings indicate "Vapor Barrier", use vapor retarder as specified herein.

Types of work specified in this section include: 15 mil thick polyolefin geo-membrane.

1.3 INDEPENDENT TESTING:

Manufacturer shall submit to Architect independent test results showing proof that product permeance is less than 0.01 perm, after conditioning (ASTM E 1745, Sections 7.1.2 – 7.1.5).

2.0 MATERIALS

2.1 VAPOR BARRIER

Vapor Barrier shall be minimum 15 mil thick polyolefin geo-membrane 180 certified Virgin resins. Perm rating shall be less than 0.01 gr./square foot/hour or lower, per ASTM E-96.

2.2 POLYETHYLENE SHEET MATERIAL WILL NOT BE ACCEPTABLE.

2.3 APPROVED PRODUCTS:

Provided manufacturer can produce independent results proving product perm rating after conditioning (ASTM E 1745, Section 7.1.2 – 7.1.5). The following manufacturers are approved.

- A. Stego Industries LLC; Stego Wrap Vapor Barrier
- B. W. R. Meadows, Inc.; Perminator 15 mil Vapor Mat.
- C. Reef Industries, Inc., Griffolyn 15 mil Green

3.0 INSTALLATION

3.1 APPLICATION:

Install over clean, compacted subgrade/gravel areas to receive concrete slabs. Install under slab on grade and where shown on drawings. Application shall be continuous with all seams well lapped and sealed. Turn edges up minimum 1" above top of slabs elevation at abutting vertical surfaces; behind expansion joint material, neatly trim excess above slab after placing finish.

3.2 ADHESIVE:

Use adhesive continuously at all overlaps. Apply to both surfaces. Allow to become tacky and then press surfaces together without trapping air. Lap joints a minimum of 6 inches. Follow manufacturer's written directions. Keep away from flame. Protect skin and eyes. Protect from

damage and punctures until slab is poured.

3.3 PIPES:

All soil and water pipes and conduits and other vertical projections shall be sealed tight around with vapor barrier turned up and sealed with mastic, as per manufacturer's recommendations.

3.4 PATCHING:

Before concrete is poured, patch all holes and rips using adhesive and pieces of specified geomembrane cut to cover area of hole.

END OF SECTION 07 26 00

SECTION 07 92 00 - JOINT SEALANTS

1.0 GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. Extent of each form and type of joint sealer is indicated on drawings and schedules.
- B. This Section includes joint sealers for the following locations:
 - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below.
 - a. Control and expansion joints in unit masonry.
 - b. Joints between different materials listed above.
 - c. Perimeter joints between materials listed above and frames of doors and windows.
 - d. Other joints as indicated.
 - 2. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
 - a. Perimeter joints of exterior openings where indicated.
 - b. Tile control and expansion joints.
 - c. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - d. Perimeter joints of toilet fixtures.
 - e. Other joints as indicated.
 - 3. Interior joints in horizontal traffic surfaces as indicated below:
 - a. Control and expansion joints in stone flooring.
 - b. Other joints as indicated.
- C. Sealing joints related to flashing and sheet metal for roofing is specified in Division-07 00 00 Section: 07 60 00 "Flashing and Sheet Metal."
- D. Sealants for glazing purposes are specified in Division-08 00 00 Section: 08 80 00 "Glazing."

1.3 SEALANT DEFINITIONS: (For reference purposes only. Refer to industry standards for precise definitions.)

- A. Type I: Self-leveling, pour grade
- B. Type II: Non-sag, gun grade
- C. Type NS: Non-sag, gun grade
- D. Class A: Capable of 25% expansion / contraction

- E. Class 25: Capable of 25% expansion / contraction
- F. Class 12: Capable of 12% expansion / contraction
- G. Type S: Single component
- H. Type M: Multi-component
- I. Grade P: Pourable, self leveling
- J. Grade NS: Non-sag, gunable
- K. Use T: Traffic areas, walk ways, plazas, decks, parking garages
- L. Use NT: Non-traffic areas
- M. Use M: Bonds to mortar
- N. Use G: Bonds to glass
- O. Use A: Bonds to aluminum
- P. Use O: Bonds to other surfaces than mortar, glass or aluminum
- Q. Use I: Suitable for use in continuously submerged situations

1.4 SYSTEM PERFORMANCES:

- A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1.5 SUBMITTALS:

- A. Product Data from manufacturers for each joint sealer product required, including instructions for joint preparation and joint sealer application.
- B. Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- C. Product test reports for each type of joint sealers indicated, evidencing compliance with requirements specified.

1.6 QUALITY ASSURANCE:

- A. Installer Qualifications: Engage an Installer who has successfully completed within the last 3 years at least 3 joint sealer applications similar in type and size to that of this Project.
- B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.8 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.

2. When joint substrates are wet due to rain, frost, condensation, or other causes.

B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.9 SEQUENCING AND SCHEDULING:

A. Sequence installation of brick joint sealers to occur not less than seven days prior to installation of water repellent coating.

1.10 WARRANTY:

A. Provide full 5 year material and labor warranty against all failures in material and workmanship.

2.0 PRODUCTS

2.1 MATERIALS, GENERAL:

A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

2.2 ELASTOMERIC JOINT SEALANTS:

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses.

- B. One-Part Polysulfide Sealant: Type S; Grade NS; Class 12-1/2; Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
- C. One-Part Neutral Cure Silicone Sealant: Type S, Grade NS, Class 25, and complying with the following requirements for Uses and additional joint movement capability:
 - 1. Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
- D. One-Part High-Modulus Neutral Cure Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, M, G, A, and, as applicable to joint substrates indicated, O.
- E. One-Part Acid-Curing Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to joint substrates indicated, O.
- F. One-Part Nonsag Urethane Sealant for Use NT: Type S; Grade NS; Class 25; and Uses NT, M, A, and, as applicable to joint substrates indicated, O.
- G. One-Part Nonsag Urethane Sealant for Use T: Type S, Grade NS, Class 25, and complying with the following requirements for Uses:
 - 1. Uses T, NT, M, G, A, and, as applicable to joint substrates indicated, O.
- H. Products: Subject to compliance with requirements, provide one of the following:
 - 1. One-Part Polyurethane Sealant:
 - a. Pecora Dynatrol T-XL.
 - b. Tremco-Vulkem 116 Polyurethane
 - c. DAP Premium Polyurethane
 - 2. Two-Part Polyurethane Sealant:
 - a. Pecora Corp; Dynatrol II, 2 Part Polyurethane
 - b. Sikaflex 2C.NS
 - c. Tremco Dymonic 240
 - 3. One-Part Neutral Cure Silicone Sealant:
 - a. "Dow Corning 790"; Dow Corning Corp.
 - b. "864"; Pecora Corp.
 - c. "Spectrum 1"; Tremco, Inc.
 - d. "Spectrum 2"; Tremco, Inc.
 - e. "Dow Corning 795"; Dow Corning Corp.
 - f. Products Div., Rexnord Chemical Products Inc.
 - 4. One-Part Sanitary Silicone Sealant:
 - a. Pecora Corp., Clean or White 898 NST Sanitary Silicone Sealant
 - b. Tremsil 200, Tremco, Inc.
 - c. Dow Sanitary Silicone Sealant
 - 5. One-Part Neutral Cure Silicone Sealant:

- a. "Dow Corning 784"; Dow Corning Corp.
 - b. "Dow Corning 799"; Dow Corning Corp.
 - c. "Ultraglaze SSG 4000"; General Electric Co.
 - d. "895NST" Precora Corp.
 - e. Tremco – Spectrum 2
6. One-Part Acid-Curing Silicone Sealant:
- a. "Chem-Calk 1200"; Bostik Construction Products Div.
 - b. "Dow Corning 999A"; Dow Corning Corp.
 - c. "SCS 1000"; General Electric Co.
 - d. "Construction 1200"; General Electric Co.
 - e. "860"; Pecora Corp.
 - f. "Rhodorsil 3B"; Rhone-Poulenc Inc.
 - g. "Rhodorsil 90"; Rhone-Poulenc Inc.
 - h. "OmniPlus"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
 - i. "Proglaze"; Tremco, Inc.
7. One-Part Nonsag Urethane Sealant for Use NT:
- a. "Chem-Calk 900"; Bostik Construction Products Div.
 - b. "Chem-Calk 2639"; Bostik Construction Products Div.
 - c. "Vulkem 116"; Tremco, Inc.
 - d. "Dymonic FC"; Tremco, Inc.
 - e. "Dymonic 100"; Tremco, Inc.
 - f. "Dynatrol I-XL"; Pecora Corp.
 - g. "Permapol RC-1"; Products Research & Chemical Corp.
 - h. "Sikaflex-1a"; Sika Corp.
 - i. "Sikaflex-15LM"; Sika Corp.
 - j. "Sonolastic NP 1"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
 - k. "Dymonic"; Tremco Inc.
8. One-Part Nonsag Urethane Sealant for Use T:
- a. "Chem-Calk 900"; Bostik Construction Products Div.
 - b. "Permapol RC-1"; Products Research & Chemical Corp.
 - c. "Sikaflex-1a"; Sika Corp.
 - d. "Sikaflex-15LM"; Sika Corp.
 - e. "Dynatrol I-XL"; Precora Corp.
 - f. Dymonic 100, Tremco, Inc.

2.3 SOLVENT-RELEASE-CURING JOINT SEALANTS:

- A. Acrylic Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing, acrylic terpolymer sealant complying with ASTM C 920 for Type S; Grade NS; Uses NT, M, G, A, and, as applicable to joint substrates indicated, O; except for selected test properties which are revised as follows:
1. Heat-aged hardness: 40-50.
 2. Weight loss: 15 percent.
- B. Butyl Sealant: Manufacturer's standard one-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657 for Type I and formulated with

minimum of 75 percent solids to be nonstaining, paintable, and have a tack-free time of 24 hours or less.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Butyl Sealant:

- a. "Chem-Calk 300"; Bostik Construction Products Div.
- b. "BC-158"; Pecora Corp.
- c. "PTI 757"; Protective Treatments Inc.
- d. "Tremco Butyl Sealant"; Tremco Inc.

2.4 LATEX JOINT SEALANTS:

A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior locations involving joint movement of not more than plus or minus 5 percent.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Acrylic-Emulsion Sealant:

- a. "Chem-Calk 600"; Bostik Construction Products Div.
- b. "AC-20"; Pecora Corp.
- c. "Sonolac"; Sonneborn Building Products Div.; Rexnord Chemical Products, Inc.
- d. "Tremco Acrylic Latex 834"; Tremco Inc.

2.5 FIRE-RESISTANT JOINT SEALERS:

A. General: Provide manufacturer's standard fire-stopping sealant, with accessory materials, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. Foamed-In-Place Fire-Stopping Sealant: Two-part, foamed-in-place, silicone sealant formulated for use in a through-penetration fire-stop system for filling openings around cables, conduit, pipes and similar penetrations through walls and floors.

C. One-Part Fire-Stopping Sealant: One part elastomeric sealant formulated for use in a through-penetration fire-stop system for sealing openings around cables, conduit, pipes and similar penetrations through walls and floors.

D. Products: Subject to compliance with requirements, provide one of the following:

1. Foamed-In-Place Fire-Stopping Sealant:

- a. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
- b. "Pensil 200"; General Electric Co.
- c. CP620 Fire Foam; Hi Hi USA

2. One-Part Fire-Stopping Sealant:

- a. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.

- b. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
- c. "Pensil 100"; General Electric Co.
- d. "Fyre Putty"; Standard Oil Engineered Materials Co.

2.6 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type which 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. Diameter of backer rod shall be 25% larger than joint width.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonwaxing, nonextruding strips of flexible, nongassing plastic foam of material indicated below; nonabsorbent to water and gas; and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Either open-cell polyurethane foam or closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self- adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS:

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
- C. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.
- D. Accessory Materials for Fire-Stopping Sealants: Provide forming, joint fillers, packing and other accessory materials required for installation of fire-stopping sealants as applicable to installation conditions indicated.

3.0 EXECUTION

3.1 EXAMINATION:

- A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellants; water; surface dirt; and frost.
 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on reconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALERS:

- A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C 1193 for use of solvent-release-curing sealants.
- D. Latex Sealant Installation Standard: Comply with requirements of ASTM C 1193 for use of latex sealants.
- E. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during

application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

- a. Do not leave gaps between ends of joint fillers.
- b. Do not stretch, twist, puncture, or tear joint fillers.
- c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.

3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.

F. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 6A in ASTM C 962, unless otherwise indicated.

H. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials to fill openings around mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.4 SEALANT LOCATIONS:

- A. Premium quality acrylic latex with no silicone additives: All interior painted conditions.
- B. Elastomeric multi-part polyurethane sealant or integrally colored silicone sealant: all exterior building control joints, sealant applied expansion joints and joints around metal items.
- C. White silicone bath sealant: all toilet fixture junctures to walls and floors.
- D. Clear silicone sealant: all kitchen equipment junctures.
- E. Butyl Sealant: roofing and flashing components and bedding for exterior thresholds.

3.5 CLEANING:

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.6 PROTECTION:

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 13 00 – HOLLOW METAL DOORS AND FRAMES

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of standard steel doors and frames is indicated and scheduled on drawings.

- A. Custom hollow metal work is specified herein.
- B. Finish hardware is specified elsewhere in Division-8.
- C. Building in of anchors and grouting of frames in masonry construction is specified in Division 4.

1.3 QUALITY ASSURANCE:

- A. Provide doors and frames complying with Steel Door Institute "recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
- B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.
- B. Shop Drawings: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
 - 1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
 - 2. Indicate coordinate of glazing frames and stops with glass and glazing requirements.
- C. Label Construction Certification: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification for that each door and frame assembly has been constructed to

conform to design, materials and construction equivalent to requirements for labeled construction.

1.5 DELIVERY AND STORAGE:

- A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.
- B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelter which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Acceptable Manufacturers: Subject to compliance with contract documents requirements, manufacturers offering steel doors and frames which may be incorporated in the work include, but are not limited to, the following:

- B. Manufacturer:

- 1. Steel Doors and Frames:

- Allied Steel Products, Inc.
 - Amweld/Div. American Welding & Mfg. Co.
 - Ceco Corp.
 - Copco Door Co.
 - Curries Mfg., Inc.
 - Premier Products, Inc.
 - Fenestra Corp.
 - Kewanee Corp.
 - Mesker Industries, Inc.
 - Pioneer Buildings Products Corp./Div. CORE Industries, Inc.
 - Steelcraft/Div. American Standard Co.
 - Trussbilt, Inc.
 - Republic Builders Products Corp./Subs. Republic Steel
 - Habersham Metal Products, Inc.

- 2. Thermal Rated Steel Door and Frame Assemblies:

- Ceco Corp.
 - Copco Door Co.
 - Curries Mfg., Inc.
 - Fenestra Corp.

Mesker Industries, Inc.
Pioneer Builders, Products Corp./Div. CORE Industries, Inc.
Habersham Metal Products, Inc.

2.2 MATERIALS:

- A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.
- C. Supports and Anchors: Fabricate of not less than 18 gauge galvanized sheet steel.
- D. Inserts, Bolts, and Fasteners: Manufacturer's standard units, except hot-dip galvanized items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
- E. Shop Applied Paint:

Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints.

2.3 FABRICATION, GENERAL:

- A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant.

Clearly identify work that cannot be permanently factory-assembled before shipment to assure proper assembly at project site. Comply with SDI-100 requirements, except where shown otherwise on the drawings:

- 1. Interior Doors: minimum 18 gauge faces.
- 2. Exterior Doors: minimum 16 gauge faces. Door cores to be completely filled with rigid polyurethane core chemically bonded to all interior faces with a minimum insulation factor of R-10.
- B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel.
- C. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from cold-rolled steel.
- D. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.
- E. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with

applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.

- F. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
- G. Locate finish hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware, published by Door and Hardware Institute.
- H. Shop Painting:
 - 1. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
 - 2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
 - 3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

2.4 STANDARD STEEL FRAMES:

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 16-gauge cold-rolled furniture steel. Frames and openings in exterior doors shall have 14 gauge metal.
- B. Fabricate frames with mitered and welded corners.
- C. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.
- D. Sound Proofing: Doors noted on schedule to be "Sound Proof" shall have compressible gasket strip continuously on door stop head and jambs. Gasket shall be built-in to frame, not "applied". Product shall equal Pioneer Pio-Seal.

3.0 EXECUTION

3.1 INSTALLATION:

- A. General: Install standard steel doors; frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
- B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.
 - 1. Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed,

aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

2. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels. Provide one anchor per jamb per 2'-0" of height or fraction thereof when above 7'-0" high.
3. Install fire-rated frames in accordance with NFPA Std. No. 80.
4. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with tapping screws.

C. Door Installation:

1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
2. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.

3.2 ADJUST AND CLEAN:

- A. Prime Coat Touch-Up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
- B. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.
- C. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 08 13 00

SECTION 08 33 00 – ROLLING SERVICE DOORS

Series 300 - Commercial Slat Door

Part 1 – GENERAL

1.01 DESCRIPTION

- A. Type: Standard Commercial Slat Doors to be manufactured by Asta Door Corporation or approved equal.
- B. Operation: to be chain hoist operated using gear reduction or electric operation.
- C. Mounting: to be interior face mounted on a prepared opening.

1.02 RELATED WORK

- A. Opening preparation, access panels, finish or field painting are in the scope of the work of other sections or trades.

Part 2 - PRODUCT

2.01 CURTAIN

- A. Slats: Galvanized steel cold roll formed in continuous lengths. Galvanized according to A.S.T.M. A653-G90 and finished with baked epoxy primer and baked polyester topcoat.
 - 1. Model 324 – 24 gauge in flat or curved slat up to 16' (4.88m) wide x 16' (4.88m) high
 - 2. Model 322 – 22 gauge in flat or curved slat up to 12' (3.66m) wide x 12' (3.66m) high
- B. Endlocks: each end of alternate slats to be fitted with nylon endlocks to provide a wearing surface in the guides and to maintain slat alignment.
- C. Bottom Bar: curtain to be reinforced with a bottom bar consisting of a 2" x 1 ½" x 12-gauge angle fastened to aluminum retainer with bulb astragal.

2.02 DRUM ASSEMBLY

- A. Drum: 26-gauge 12" (304.8mm) diameter galvanized steel spiral torque tube attached to 16-gauge galvanized steel drums, with ball bearings, supported by 1-5/16" O.D. steel tubing.
- B. Springs: factory lubricated, oil tempered, helical torsion springs located inside the barrel made of wire conforming to ASTM A229. Springs are attached to the steel axle tube by means of a welded spring clip, the springs are designed to cycle 12,500 times.
- C. End Bearings: to be self-lubricating ball bearings.

2.03 SUPPORT BRACKETS

- A. Support Brackets: to be 3/16" (4.76mm) thick steel angles and a 1/4" (6.35mm) thick steel diagonal brace welded in a triangular form to support ends of drum assembly.

2.04 OPERATION

- A. Drive: reduction gear chain hoist standard for all sizes.
- B. Hand Chain: to be galvanized machine link. Pull not to exceed 35 lbs.
- C. Electric Operation: Wall mounted jackshaft motor.

2.05 GUIDE ASSEMBLY

- A. Guides: to be roll formed 12-gauge heavy duty galvanized steel channels (3 1/2" deep).
- B. Guide Depth: to provide slat penetration adequate to satisfy specified windloading.

2.06 LOCKING

- A. Hand Chain Lock: bracket, to be mounted on guide angle or wall.
- B. Curtain Lock: hardened galvanized steel slide bolts attached to bottom angle suitable for padlocking. (padlock by others)

2.07 FINISH

A. Ungalvanized Surfaces: to be shop coated with rust reducing black prime paint. Finish options, satin white, gray or tan topcoat.

3.01 INSTALLATION

A. Installation: to be by Asta Door Corporation authorized representative according to Asta Door Corporation standards and instructions.

END OF SECTION 08 33 00

SECTION 09 25 00 - GYPSUM WALLBOARD SYSTEMS

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Extent of each type of gypsum drywall construction required is indicated on Drawings.

B. This section includes the following types of gypsum board construction:

1. Gypsum board screw-attached to steel framing and furring members.
2. Gypsum board nail-attached to wood framing and furring members.

C. Wood framing and furring are specified in the following Division 6 sections:

1. "Rough Carpentry".
2. "Prefabricated Wood Trusses".

1.3 DEFINITIONS:

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and Gypsum Association publications for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

1.4 SUBMITTALS:

A. Product data from manufacturers for each type of product specified.

1.5 QUALITY ASSURANCE:

A. Fire-Resistance Ratings: Where indicated, provide materials and construction which are identical to those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

1. Provide fire-resistance-rated assemblies identical to those indicated by reference to GA File No's. in GA-600 "Fire Resistance Design Manual" or to design designations in U.L. "Fire Resistance Directory" or in listing of others testing and agencies acceptable to authorities having jurisdiction.

B. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

C. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.

B. Minimum Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 degrees F (4 degrees C). For adhesive attachment and finishing of gypsum board maintain not less than 50 degrees F (10 degrees C) for 48 hours prior to application and continuously thereafter until drying is complete.

C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

2.0 PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

B. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Steel Framing and Furring:

- a. Bostwick Steel Framing Co.
- b. Gold Bond Building Products Div., National Gypsum Co.
- c. Marino Industries Corp.
- d. United States Gypsum Co.

2. Grid Suspension Systems:

- a. Chicago Metallic Corp.
- b. National Rolling Mills Co.

3. Gypsum Boards and Related Products:

- a. Georgia-Pacific Corp.
- b. Gold Bond Building Products Div., National Gypsum Co.
- c. United States Gypsum Co.

2.2 LAMINATING ADHESIVE:

A. Use adhesive complying with wallboard manufacturer's recommendations.

2.3 SEALANTS:

- A. Acoustical Sealant: USG Acoustical Sealant or equal.

2.4 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS:

- A. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.

- B. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.

- C. Channels: Cold-rolled steel, 0.0598 inch minimum thickness of base (uncoated) metal and 7/16 inch wide flanges, protected with rust-inhibitive paint, and as follows:

1. Carrying Channels: 2 inches deep, 590 lbs. per 1000 ft., unless otherwise indicated.
2. Carrying Channels: 1-1/2 inch deep, 475 lbs. per 1000 ft., unless otherwise indicated.
3. Furring Channels: 3/4 inch deep, 300 lbs. per 1000 ft., unless otherwise indicated.

- D. Steel Studs for Furring Channels: ASTM C 645, with flange edges bent back 90 degrees doubled over to form 3/16 inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:

1. Thickness: 0.0179 inch, unless otherwise indicated.
2. Depth: As indicated.

- E. Steel Rigid Furring Channels: ASTM C 645, hat-shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:

1. Thickness: 0.0179 inch, unless otherwise indicated.

- F. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, complying with ASTM C 645 for material, finish and widths of face and fastening flange, fabricated to form 1/2 inch deep channel of the following configuration:

1. Single-Leg Configuration: Assymetric-shaped channel with face connected to a single flange by a single slotted leg (web).
2. Double-Leg Configuration: Hat-shaped channel, with 1-1/2 inch wide face connected to flanges by double slotted or expanded metal legs (webs).
3. Configuration: Either one indicated above.

- G. Grid Suspension System: ASTM C 645, manufacturer's standard grid suspension system composed of main beams and cross furring members which interlock to form a modular supporting network.

2.5 STEEL FRAMING FOR WALLS AND PARTITIONS:

A. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16" minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 0.0179 inch, unless otherwise indicated, for non load bearing walls.
2. Refer to structural drawings for load bearing studs.
3. Depth as indicated on drawings.

B. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, complying with ASTM C 645 for base metal, finish and widths of face and fastening flange, fabricated to form 1/2 inch deep channel of the following configuration:

1. Single-Leg Configuration: Assymetric-shaped channel with face connected to a single flange by a single slotted leg (web).
2. Double-Leg Configuration: Hat-shaped channel, with 1-1/2 inch wide face connected to flanges by double slotted or expanded metal legs (webs).
3. Configuration: Either one indicated above.

C. Z-Furring Members: Manufacturer's standard zee-shaped furring members with slotted or nonslotted web, fabricated from hot-dip galvanized steel sheet complying with ASTM A 525, Coating Designation G60; with a minimum base metal (uncoated) thickness of 0.0179 inch, face flange of 1-1/4 inch, wall attachment flange of 7/8 inch, and of depth required to fit insulation thickness indicated.

D. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum drywall manufacturers for applications indicated.

2.6 GYPSUM BOARD:

A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end joints.

1. Thickness: Provide gypsum board in thicknesses indicated, or if not otherwise indicated, in either 1/2 inch or 5/8 inch thicknesses to comply with ASTM C 840 for application system and support spacing indicated.

B. Gypsum Wallboard: ASTM C 36, and as follows:

1. Type: Regular, unless otherwise indicated.
2. Type: Foil-backed where indicated.
3. Type: Type X for fire-resistance-rated assemblies.
4. Edges: Tapered
5. Thickness: As indicated.
6. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work where Type X gypsum wallboard is indicated include, but are not limited to, the following:

a. "Fire-Shield G"; Gold Bond Building Products Div., National Gypsum Co.

b. "SHEETROCK Brand FIRECODE 'C' Gypsum Panels"; United States Gypsum Co.

C. Gypsum Backing Board for Multi-Layer Applications: ASTM C 442 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 36, and as follows:

1. Type: Regular, unless otherwise indicated.
2. Type: Foil-backed where indicated.
3. Type: Type X for fire-resistance and non fire-resistance rated assemblies.
4. Edges: Manufacturer's standard.
5. Thickness: As indicated.

D. Water-Resistant Gypsum Backing Board: ASTM C 630 at wet areas ie: Restrooms, Kitchens, Janitor's Closet, and as follows:

1. Type: Type X for fire-resistance and non fire-resistance rated assemblies.
2. Thickness: As indicated.

E. Exterior Gypsum Soffit Board: ASTM C 931, with manufacturer's standard edges, of type and thickness indicated below:

1. Type: Regular, unless otherwise indicated.
2. Thickness: 5/8 inch, unless otherwise indicated.

2.7 TRIM ACCESSORIES:

A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal, plastic or metal combined with paper, with metal complying with the following requirements.
 - a. Sheet steel zinc-coated by hot-dip process.
 - b. Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.

2. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:

- a. "LC" Bead, unless otherwise indicated.
- b. "LK" Bead with square nose for use with kerfed jambs.
 - c. "L" Bead where indicated.
 - d. "U" Bead where indicated.

3. One-Piece Control Joint: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.

B. Metal Cornerbead and Edge Trim for Exterior Ceilings: Comply with the following requirements:

1. Edge trim complying with ASTM C 1047, formed from rolled zinc, shape "LC" Bead per Fig. 1, unless otherwise indicated.
2. Aluminum Edge Trim: Where indicated, provide manufacturer's standard extruded aluminum edge trim of profile shown or referenced by manufacturer's standard product designation, fabricated from aluminum alloy 6063 T5 complying with ASTM B 221, finished as follows:
 - a. Class I Clear Anodized Finish: AA-C12C22A42 (chemically cleaned; chemical etch, medium matte; 0.7 mil minimum thick clear anodic coating).

2.8 GYPSUM BOARD JOINT TREATMENT MATERIALS:

A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

B. Joint Tape: Paper reinforcing tape, unless otherwise indicated.

1. Use pressure sensitive or staple-attached open-weave glass fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

C. Setting-Type Joint Compounds: Factory-prepackaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

1. Where setting-type joint compounds are indicated for use as taping and topping compounds, use formulation for each which develops greatest bond strength and crack resistance and is compatible with other joint compounds applied over it.
2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer for this purpose.
3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer for this purpose.

D. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mix Formulation: Factory-premixed product.
2. Job-Mixed Formulation: Powder product for mixing with water at Project site.
3. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.
4. Topping compound formulated for fill (second) and finish (third) coats.
5. All-purpose compound formulated for use as both taping and topping compound.

2.9 MISCELLANEOUS MATERIALS:

A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.

- B. Gypsum Board Screws: ASTM C 1002.
- C. Sound Attenuation Blankets: Unfaced mineral fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C665 for Type I (blankets without membrane facing); and as follows:

- 1. Mineral Fiber Type: Fibers manufactured from glass or slag.

2.10 TEXTURE FINISH MATERIALS:

- A. Primer: Of type recommended by manufacturer of texture finish.

B. Polystyrene Aggregated finish for Ceilings: Manufacturer's standard proprietary product formulated with polystyrene aggregates for spray application, with surface burning characteristics of 25 per ASTM E 84, and in texture indicated. Use only where indicated.

C. Available Products: Subject to compliance with requirements, polystyrene aggregated finishes which may be incorporated in the Work include, but are not limited to, the following:

- 1. "Imperial QT SPRAY Medium Texture Finish"; United States Gypsum Co.
 - 2. "Perfect Spray Medium"; Gold Bond Building Products Div., National Gypsum Co.

3.0 EXECUTION

3.1 EXAMINATION:

A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Ceiling Anchorages: Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

3.3 INSTALLATION OF STEEL FRAMING, GENERAL:

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

C. Isolate steel framing from building structure to prevent transfer of loading imposed by

structural movement, at locations indicated below to comply with details shown on Drawings:

1. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
2. Where partition and wall framing abuts overhead structure.
 - a. Provide slip or cushioned type joints as detailed to attain lateral support and avoid axial loading.

D. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members or as indicated.

3.4 INSTALLATION OF STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS:

A. Screw furring members to wood framing.

B. Do not connect or suspend steel framing from ducts, pipes or conduit.

C. Keep hangers and braces 2 inches clear of ducts, pipes and conduits.

D. Sway-brace suspended steel framing with hangers used for support.

E. Install suspended steel framing components in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.

1. Wire Hangers: 0.1620 inch diameter (8 gage), 4 ft. on center.
2. Carrying Channels (Main Runners): 1-1/2 inch, 4 ft. on center.
3. Rigid Furring Channels (Furring Members): 16 inches on center.
4. Rigid Furring Channels (Furring Members): 24 inches on center.

F. Installation Tolerances: Install steel framing components for suspended ceilings so that cross furring members or grid suspension members are level to within 1/8 inch in 12 ft. as measured both lengthwise on each member and transversely between parallel members.

G. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

H. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross furring members to each other and butt-cut to fit into wall track.

I. For exterior soffits provide cross-bracing and additional framing indicated or required to resist wind uplift.

3.5 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS:

A. Install runners (tracks) at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.

- B. Installation Tolerances: Install each steel framing and furring member so that fastening surface do not vary more than 1/8 inch from plane of faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
- D. Terminate partition framing at suspended ceilings where indicated.
- E. Install steel studs and furring in sizes and at spacings indicated but not less than that required by referenced steel framing installation standard.
 - 1. For single layer construction: 16 inches on center.
 - 2. For single and double layer construction: 24 inches on center.
- F. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flange.
- G. Frame door openings to comply with details indicated, with ASTM C754 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - 1. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- H. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

3.6 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL:

- A. Gypsum Board Application and Finishing Standard:
 - 1. Install and finish gypsum board to comply with ASTM C840.
 - a. Sheetrock Brand Primer Surfacer is acceptable for level 5 finish.
 - 2. Refer to Specifications Section 09900, 3.8, D for Level 5 finish requirements per paint sheen.
- B. Install sound attenuation blankets where indicated, prior to gypsum board unless readily installed after board has been installed.
- C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
- D. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24 inches.
- E. Install wall/partition boards in manner which minimizes the number of end-butt joints or

avoids them entirely where possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.

F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

G. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

H. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.

I. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

J. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32 inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.

K. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories. If not otherwise shown, control joints shall be minimum spacing of 30 feet.

L. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.

1. Except where concealed application is indicated or required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. are, and may be limited to not less than 75 percent of full coverage.

M. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4 inch to 1/2 inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.

N. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board over wood framing, with "floating" internal corner construction.

O. Where sound-rated drywall construction is indicated, seal construction at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.

P. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.7 METHODS OF GYPSUM BOARD APPLICATION:

A. Single-Layer Application: Install gypsum wallboard as follows:

1. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
2. On partitions/walls apply gypsum board horizontally, unless otherwise indicated, and provide sheet lengths which will minimize end joints.
3. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
4. On Z-furring members apply gypsum board vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

B. Double-Layer Application: Install gypsum backing board for base layer and gypsum wallboard for face layer.

1. On ceilings apply base layer prior to application of face layer on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10 inches. Apply base layers at right angles to supports unless otherwise indicated.
2. On partitions/walls apply base layer and face layers vertically (parallel to framing) with joints of base layer over supports and face layer joints offset at least 10 inches with base layer joints.
3. On Z-furring members apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

C. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

1. Fasten with screws.
2. Fasten to wood supports with double nailing.

D. Double-Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer as follows:

1. Fasten both base layers and face layers separately to supports with screws.
2. Fasten base layers with screws and face layer with adhesive and supplementary fasteners.
3. Fasten base layers to wood supports with nails and face layer with adhesive and supplementary fasteners.

E. Exterior Soffits and Ceilings: apply exterior gypsum soffit board perpendicular to supports, with end joints staggered over supports. Install with 1/4 inch open space where boards abut other construction.

1. Fasten with cadmium-plated screws, or with galvanized or aluminum nails where supports are nailable.

3.8 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Install corner beads at external corners.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.

1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install "LK" bead where substrate is kerfed to receive long flange of trim.
3. Install "L" bead where edge trim can only be installed after gypsum board is installed.
4. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

D. Install U-bead where indicated, and where exterior gypsum board edges are not covered by applied moldings or indicated to receive edge trim with face flanges covered with joint compound.

E. Install control joints at locations indicated, or if not indicated, at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

F. Install H-molding in exterior gypsum drywall construction where control joints are indicated.

3.9 FINISHING OF DRYWALL:

A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:

1. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.
2. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.

E. Finish exterior gypsum soffit board by using setting-type joint compounds to prefill joints, embed tape, and to apply first, fill (second) and finish (third) coats; smooth each coat before joint compound hardens to minimize need for sanding; sand between coats and after finish coat.

1. Painting of exterior gypsum soffit board after finish coat has dried is specified in Division-9 Section "Painting".

F. Water-Resistant Gypsum Backing Board Base for Ceramic Tile: Comply with ASTM C 840 and manufacturer's recommendations for treatment of joints behind tile.

G. Partial Finishing: Omit third coat and sanding on concealed drywall construction

which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

3.10 APPLICATION OF TEXTURE FINISH:

A. Surface Preparation and Primer: Prepare and prime drywall and other surfaces in strict accordance with texture finish manufacturer's instructions. Apply primer to all surfaces to achieve texture finish.

B. Finish Application: Mix and apply finish to drywall and other surfaces indicated to receive finish in strict accordance with manufacturer's instructions to produce a uniform texture matching Architect's sample without starved spots or other evidence of thin application, and free of application patterns.

C. Remove any texture droppings or overspray from door frames, windows and other adjoining construction.

3.11 PROTECTION:

A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Substantial Completion.

END OF SECTION 09250

SECTION 09 51 00 - ACOUSTICAL CEILINGS

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of each type of acoustical ceiling is shown and scheduled on drawings.

Types of acoustical ceilings specified in this section include the following: Acoustical panel ceilings, exposed suspension.

1.3 QUALITY ASSURANCE:

A. Installer Qualifications: Firm with not less than 3 years of successful experience in installation of ceilings similar to requirements for this project and which is acceptable to manufacturer of acoustical units, as shown by current written statement from manufacturer.

B. Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics, by UL or other testing agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.

C. Surface Burning Characteristics: As follows, tested per ASTM E 84.

1. Flame Spread: 25 or less.
2. Smoke Developed: 50 or less.

D. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by, or penetrating through, ceilings.

1.4 PRODUCT DATA: Submit manufacturer's product data and installation instructions.

1.5 SUBMITTALS:

A. Submit two (2) each samples of each tile and suspension system component, complete with all accessories.

1.6 WARRANTY

A. Provide 10 year warranty against grid support failure and sagging tiles.

2.0 PRODUCTS

2.1 ACOUSTICAL TILE:

A. Approved Manufacturers: Armstrong Corporation, CertainTeed Corporation and U.S.G Corporation. Products by other manufacturers must be submitted for approval prior to bidding in accordance with provisions of Division I. Any product submitted for approval shall meet or exceed the NRC and CAC and other performance characteristics of the specified products.

B. Approved Products:

2.2 ACOUSTICAL SUSPENSION SYSTEM:

A. Provide grid and panels from same manufacturer when available. Exposed grid shall be fire-rated where required. Match tile color. Standard 15/16" exposed tee width. Use USG-Donn "DX" Ceiling Grid System or similar grid product by Armstrong, CertainTeed or Chicago Metallic, consistent with specified panel. Provide hold-down clips for all Type III ceilings (gymnasium).

B. Where Type II or Type III ceiling tile panels are shown, use either USG AX all aluminum grid with stainless steel clips or Armstrong AL Prelude Plus XL all aluminum grid with stainless steel clips. Product manufactured by CertainTeed or Chicago Metallic will only be approved if it fully meets or exceeds the performance and all aluminum construction of the Armstrong or USG all aluminum grids.

3.0 EXECUTION:

3.1 SUSPENSION SYSTEM: Install acoustical material and suspension system, including necessary hangers, grillage, splines and other supporting hardware, in accordance with ASTM C636. All aluminum grid in kitchen requires suspension wire support along main tees at maximum 3 feet spacing, in order to achieve "Intermediate Duty". All steel grid shall be 4 feet spacing as per ASTM C636.

3.2 LEVELNESS: 1/8" in 10' – 0"; 1/4" maximum variation within room area.

3.3 CEILING GRID SYSTEM - Install hangers, main runners, cross tees, wall angles, cosmetic intersection clips and molding attachment clips in accordance with ASTM C636. Provide one additional grid wire at each corner of each lay-in light fixture, also light fixture support clips to receive NEMA Type G lay-in light fixtures at all grid locations shown on the drawings. Install four retention clips to each panel at Type III (gymnasium) ceiling.

3.4 OBTAIN SIGN OFF: Obtain sign off by Building Inspector and Fire Marshal and obtain approval by Architect before installation of ceiling tile.

3.5 CLEAN AND PROTECT: Install ceilings. Clean dirty or lightly soiled panels and grid. Replace damaged and badly soiled panels and grid.

3.6 ATTIC STOCK: Provide attic stock in original packaging in amount equal to 2% or more of total ceiling tile order.

END OF SECTION 09 51 00

SECTION 09 6600 - RESILIENT BASE

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

Extent of resilient base and accessories is shown on drawings and in schedules.

1.3 QUALITY ASSURANCE:

Manufacturer: Provide each type of resilient base and accessories as produced by a single manufacturer, including recommended primers, adhesives, and sealants.

1.4 SUBMITTALS:

A. Samples: For initial selection of colors and patterns, submit samples in form of actual sections for resilient flooring, including accessories, showing full range of colors and patterns available, for each type of resilient flooring required.

B. Replacement Materials: After completion of work, deliver to project site replacement materials from same manufacturer lot as materials installed not less than 2% of total amount installed, for each type, size, and color.

1.5 JOB CONDITIONS:

Maintain minimum temperature of 65 degrees F (18 degrees C) in spaces to receive resilient base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient base materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55 degrees F (13 degrees C) in areas where work is completed.

Install resilient base and accessories after other finishing operations, including painting, have been completed.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Resilient Base:

1. Amtico Flooring Div. American Biltrite Inc.
2. Armstrong World Industries, Inc.
3. GAF Corp., Floor Products Div.
4. Manninton Commercial

Accessories

1. Afco Rubber Corp.
2. Burke Flooring Products, Div. Burke Products, Inc.
3. Flexco Div., Textlie Rubber Co., Inc.
4. Johnson Rubber Co., Flooring Accessories, Div.
5. Musson Rubber Co.
6. Roppe Rubber Corp.
7. Vinyl Plastics Inc.

2.2 MATERIALS:

A. Accessories:

1. Wall Base (WL BS): Provide rubber base, continuous roll, without preformed or molded corner units:

Height: 4"

Thickness: 1/8" gauge.

Style: Standard top-set cove.

2. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate and accessory conditions.

3.0 EXECUTION

3.1 PREPARATION:

Broom Clean or vacuum surfaces to be covered.

3.2 INSTALLATION:

A. Accessories:

Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

3.3 CLEANING AND PROTECTION:

Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer.

Finishing: After completion of project and just prior to final inspection of work, thoroughly clean wall base.

END OF SECTION 09 66 00

SECTION 09 91 00 - PAINTING

1.0 GENERAL

1.1 DESCRIPTION:

A. Work described in this section includes:

1. Touching up of shop applied prime coats.
2. Preparation of surfaces to receive finishes.
3. Priming and back-priming of interior finish carpentry.
4. Painting, staining or otherwise finishing of all surfaces except as otherwise indicated.
5. Finishing of field painted wood doors.
6. Finishing of millwork including standing and running trim.

B. Related work specified elsewhere:

1. Shop applied primer coats.
2. Piping identification.
3. Pre-finished items.

1.2 SUBMITTALS:

A. Product Data:

1. Submit complete list of products proposed for use at least 30 days prior to commencement of painting work. (Intent of Contractor to use products specified does not relieve him from responsibility of submitting product list).
2. Indicate manufacturer, brand name, quality and type paint for each surface to be finished.

B. Color samples:

1. Color charts: Submit two sets of color charts from paint manufacturers proposed for use, for color selections by Architect.
2. Brush-out samples:
 - a. Following color selection by Architect or issuance of color schedule, prepare actual brush-out samples of each paint, stain or finish actually required for use on the project.
 - b. Submit minimum 8" x 10", brush-out samples in duplicate. Apply products in number of coats specified for actual work.
 - c. Provide brush-out samples on the following substrates:
 - 1) To simulate drywall, lumber, board products and metals for paint finish: Heavy Poster Board or Hardboard.
 - 2) To simulate wood for transparent finish provide sample(s) of: Actual species and grade specified.

1.3 DELIVERY, STORAGE AND HANDLING:

A. Delivery: Deliver materials to project site ready-mixed in original containers with labels intact; labels bearing manufacturer's name, paint type, color and recommended installation and reducing procedures. Paint material containers not displaying manufacturer's product identification will not be acceptable.

B. Storage and handling:

1. Store materials in a dry, well ventilated, covered location.
2. Maintain neat, clean conditions in storage area; remove rags and waste materials at end of

each day's work.

3. Close containers at end of day's work. Leave no materials open.

1.4 JOB CONDITIONS:

A. Environmental requirements:

1. Comply with manufacturer's recommendations as to environmental conditions under which materials may be applied.
2. Apply no materials in spaces where dust is being generated.
3. Do not apply paint to damp or wet substrates.

B. Protection: Cover finished work of other trades and surfaces not being painted concurrently and prefinished items.

C. Safety precautions:

1. Provide temporary fire protection equipment in materials storage area.
2. Prohibit smoking in storage area.

1.5 QUALITY ASSURANCE:

A. Primers, undercoat paint and finish coat paint materials shall be products of a single manufacturer unless otherwise specified.

B. Applicator qualifications: Applicator shall be approved by paint manufacturer in writing. Approval shall indicate the following:

1. Manufacturer has instructed applicator in the installation of specified material.
2. Applicator has been engaged in satisfactory application of materials on project of similar scope for at least three years.

C. Standard of Quality:

1. Prior to production application of paint coatings a "Standard of Quality" application shall be prepared for inspection and acceptance by the architect. Said application shall be made on a representative area of the project with the approved coatings applied in accordance with this specification by the coatings applicator.
2. A representative of the manufacturer of the special coatings shall be present at the job site to observe this application, inspect surfaces and conformance to specification.
3. Upon completion of this sample application, a representative of the contractor, the manufacturer and the architect shall inspect and approve this area. Upon acceptance, by the architect, said area shall become the "Standard of Quality" for subsequent coatings application, and the application contractor shall be responsible for maintaining the accepted quality throughout the subsequent application.
4. For painting of previously painted surfaces an independent testing laboratory and the paint manufacturer's representative shall determine the recommended coating. Do not apply paint to any previously painted surface until receiving written approval to proceed from independent lab.

2.0 PRODUCTS

2.1 MANUFACTURERS:

- A. Acceptable manufacturers; subject to compliance with specified requirements: (Do not use ICI products)
1. Benjamin Moore Co.
 2. Porter Paints/PPG Industries
 3. Sherwin-Williams Co.

2.2 PAINTING MATERIALS:

- A. Standard of quality: Products specified herein are as manufactured by the listed companies. and shall be the basis for the standard of quality. Products of other acceptable manufacturers specified, similar in material, type and quality, may be acceptable for use subject to approval of specified product data submittal. All products shall be the manufacturers' highest quality products.
- B. Where products other than those of the manufacturer listed as the standard of quality are specified in Painting Schedule, such products have been selected to achieve specific results and substitutions will be allowed only in accordance with Product Options and Substitutions section.
- C. Miscellaneous materials:
1. Paint thinners and tints shall be products of same manufacturer as paints or approved by him for use with his products.
 2. Shellac, turpentine, patching compounds and similar materials required for execution of work shall be compatible with painting materials and surfaces applied.
- D. Paint and stain colors shall be as scheduled with final approval based on brush-out sample submittal.
- E. All paints used must be low (<50 G/l) or no VOC.

3.0 EXECUTION

3.1 PREPARATION:

- A. Surfaces to receive finishes shall be dry and free of debris, oils, dust or other deleterious materials. Before application of coatings, quality assurance inspection shall have been performed and approved by the paint manufacturer.
- B. Treat mildewed surfaces with a solution of one quart hypochlorite bleach with 2 oz of tri-sodium phosphate to one gallon water. Rinse and allow to dry prior to painting.
- C. Lumber, plywood and veneered wood surfaces:
1. Apply shellac, maximum two pounds cut to knots, pitch and resinous sapwood prior to application of the first coat of paint. For stained surfaces, treat knots, pitch, and resinous sapwood in accordance with stain manufacturer's recommendations.
 2. For surfaces to receive paint finish, fill nail holes, and pin holes in the in-fil window panels, cracks, joints and defects with spackling compound. Apply after the first coat of paint.
 3. For surfaces to receive transparent finish, fill all nail holes, cracks and defects with wood filler matching finish color.
 4. Sand surfaces smooth using fine grit sandpaper. Dust to remove debris.

- D. Gypsum drywall: Fill narrow, shallow cracks and small holes with patching compound. Allow to dry and sand smooth without raising nap of wallboard paper.

- E. Concrete:
 - 1. Fill cracks, holes and irregularities with cement grout.
 - 2. Remove laitance, oil, grease, dirt and debris from surfaces. Allow concrete to cure prior to paint application.

- F. Smooth Face Concrete unit masonry: Rub to remove loose mortar and debris. Fill irregularities with cement grout.

- G. Galvanized metal: Wash with xylol to remove grease, oil and contaminants. Wipe dry with clean cloth. Where there is much peeling of finish paint on existing galvanized metal, consider removing remaining paint and leaving the metal unpainted.

- H. Aluminum:
 - 1. Sand or scrape to remove oxides.
 - 2. Wash with xylol to remove grease, oil and contaminants. Wipe dry with clean cloth.

- I. Ferrous metals:
 - 1. Wire brush or sandpaper to remove rust and mill scale.
 - 2. Solvent clean with xylol to remove grease, oil and contaminants. Wipe dry with clean cloth.
 - 3. Prime with Devco 167 pre-prime epoxy penetrating primer.

3.2 APPLICATION:

- A. Apply paint only when moisture content of surfaces is within manufacturer's recommended limits. Apply paint materials using clean brushes, rollers or spraying equipment.

- B. Apply materials at rate recommended by the paint manufacturer for surface being painted, less ten percent for losses.

- C. Comply with manufacturer's recommendations for drying time between coats.

- D. Sand and dust between coats to remove visible defects when viewed from a distance of five feet.

- E. Finish coats shall be smooth, free of brush marks, streaks, laps or pile-up of paint, skipped or missed areas. F. Make edges of paint adjoining other materials or colors clean and sharp without overlapping.

- G. Primer coats may be omitted for surfaces specified to receive factory applied primer if primer is compatible with finish coats. If factory applied primer coats are not compatible with finish coats, substitute a bond coat or other surface preparation measures as recommended by paint manufacturer for specified finish coats at no additional cost to Owner.

- H. Where two-coat finish is specified, prime coat shall be tinted to approximate finish color.

- I. Where portion of finish on drywall partition is damaged or unacceptable, refinish entire surface of partition.

- J. Back-prime finish carpentry and millwork with material specified for prime coat, without runs on face. Finish cut edges prior to installation.

- K. Paint inside of ductwork flat black for entire area visible through ceiling openings. Paint underside

of ductwork and other above-ceiling items flat black for entire area visible through ceiling openings.

- L. Seal tops and bottoms of interior doors with prime coat only; side edges shall be finished same as faces.
- M. Finish all edges of exterior doors same as faces.
- N. Paint exposed piping and ductwork in occupied areas same as adjacent wall surfaces.
- O. Paint exposed grilles and registers in public spaces.
- P. Paint handrails, guardrails, bollards and miscellaneous metal fabrication items exposed to view in the finished structure.
- Q. Remove and protect hardware, accessories, device plates, lighting fixtures, factory finished work and similar items, or provide in-place protection prior to painting adjacent surfaces. Upon completion of each space, carefully replace all removed items.

3.3 PAINING SCHEDULE:

A. Surfaces not requiring painting:

- 1. Exterior masonry.
- 2. Pre-finished surfaces and items.
- 3. Concealed ductwork, conduit and piping, except as visible from completed spaces.
- 4. Concrete, block or drywall surfaces above finished ceilings.
- 5. Precast concrete window sills.

B. The quantities of coats specified are minimums. Contractor is responsible for application of any additional coats necessary to achieve required coverage and color uniformity.

C. Exterior surfaces:

- 1. Ferrous metals, acrylic waterborne enamel:
 - a. First coat: Porter – PPG 6-208 Series Speedhide Rust Inhibitive Metal Primer
Benjamin Moore fresh Start Superior Primer
Sherwin Williams Pro Industrial Pro-Cryl Primer
 - b. Second coat: Porter - PP909 Advantage 900 Gloss Acrylic Enamel
Benjamin Moore BEN Ext. Acrylic Latex
Sherwin Williams Resilience Exterior Latex.
 - c. Third coat: Porter - PP909 Advantage 900 Gloss Acrylic Enamel
Benjamin Moore BEN Ext. Acrylic Latex
Sherwin Williams Resilience Exterior Latex.
- 2. Galvanized metals and aluminum, acrylic waterborne enamel:
 - a. First coat: Porter – PPG 90-712 Pitt Tech DTM Acrylic Metal Primer Finish,
Benjamin Moore fresh Start Superior Primer
Sherwin Williams Pro Industrial Pro-Cryl Primer
 - b. Second coat: Porter - PP909 Advantage 900 Gloss Acrylic Enamel
Benjamin Moore BEN Ext. Acrylic Latex
Sherwin Williams Resilience Exterior Latex.
 - c. Third coat: Porter - PP909 Advantage 900 Gloss Acrylic Enamel
Benjamin Moore BEN Ext. Acrylic Latex
Sherwin Williams Resilience Exterior Latex.

D. Interior surfaces:

- 1. Concrete unit masonry and brick, acrylic waterborne semi-gloss enamel:
 - a. First coat: Porter – PPG 6-7 Speedhide Latex Block Filler
Benjamin Moore Super Spec Block Filler

- b. Second coat: Sherwin Williams Preprite Block Filler.
Porter - PPG 90-1310 Pitt Tech Plus Acrylic Gloss Enamel
Benjamin Moore BEN Latex Enamel
Sherwin Williams Duration Home Latex Enamel.
 - c. Third coat: Porter - PPG 90-1310 Pitt Tech Plus Acrylic Gloss Enamel
Benjamin Moore BEN Latex Enamel
Sherwin Williams Duration Home Latex Enamel.
2. Ferrous metals, waterborne alkyd semi-gloss:
- a. First coat: Porter – PPG 90-712 Pitt Tech DTM Acrylic Metal Primer Finish
Benjamin Moore Super Spec Acrylic Metal Primer
Sherwin Williams Adhesion Primer.
 - b. Second coat: Porter – PPG 6-1110XI Speedhide Alkyd Semi-gloss Enamel,
Benjamin Moore Advance Alkyd Enamel
Sherwin Williams Pro Classic Enamel.
 - c. Third coat: Porter - PPG 6-1110XI Speedhide Alkyd Semi-gloss Enamel,
Benjamin Moore Advance Alkyd Enamel
Sherwin Williams Pro Classic Enamel.
3. Galvanized metals and aluminum, waterborne alkyd semi-gloss:
- a. First coat: Porter – PPG 90-712 Pitt Tech DTM Acrylic Metal Primer Finish,
Benjamin Moore Super Spec Acrylic Metal Primer, Sherwin
Williams Adhesion Primer.
 - b. Second coat: Porter - PPG 6-1110XI Speedhide Alkyd Semi-gloss Enamel,
Benjamin Moore Advance Alkyd Enamel
Sherwin Williams Pro Classic Enamel.
 - c. Third coat: Porter - PPG 6-1110XI Speedhide Alkyd Semi-gloss Enamel,
Benjamin Moore Advance Alkyd Enamel
Sherwin Williams Pro Classic Enamel.
4. Gypsum Wall Board – Semi Gloss Finish
- a. Primer Coat: Porter PPG: Speedhide Interior Latex Sealer
Benjamin Moore: Fresh Start All Purpose 100% Acrylic Primer
Sherwin Williams: Prep Rite Classic Latex Primer
 - b. Second Coat: Porter PPG: HiHide Semi Gloss Interior Latex
Benjamin Moore: Super Spec Latex Semi Gloss Enamel W 276
Sherwin Williams: ProMar Classic Waterbourne Semi Gloss
 - c. Third Coat: Porter PPG: HiHide Semi Gloss Interior Latex
Benjamin Moore: Super Spec Latex Semi Gloss Enamel W 276
Sherwin Williams: Pro Mar Classic Waterbourne 3. Semi Gloss

3.4 MAINTENANCE MATERIALS:

- A. Furnish minimum one gallon of each paint color and finish used on project for Owner's maintenance use.
- B. Properly identify each container with manufacturer, color name, product number, and color formula
- C. Store materials at location designated by the Owner.

END OF SECTION 09 91 00

SECTION 10 28 13 - TOILET ACCESSORIES

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of each type of toilet accessory is indicated on drawings and schedules.

B. Types of toilet accessories required include the following:

- A. Grab Bars
- B. Toilet Tissue Dispenser
- C. Wall Waste Receptor
- D. Sanitary Napkin Disposal
- E. Paper Towel Dispenser
- F. Soap Dispenser
- G. Mop Clip Strip
- H. Hand Dryer
- I. Mirrors (Framed)
- J. Pipe Insulation
- K. Shower Curtain Rod
- L. Shower Curtain and Hooks
- M. Towel Bar

C. Some types of toilet accessories are included as part of Section, "Toilet Partitions".

D. Mirrors, unframed, are specified in Section 08800, Glass and Glazing.

1.3 QUALITY ASSURANCE:

A. Inserts and Anchorages: Furnish inserts, blocking and anchoring devices which must be set in concrete, built into masonry, or framed gypsum board walls coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.

C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect. All keyed products shall be from a single manufacturer.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work.

1.5 WARRANTIES:

- A. Mirrors – 10 year against silver spoilage.
- B. Hand Dryers – 3 years for parts, labor and installation.

2.0 PRODUCTS

2.1 MATERIALS:

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating
- D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service)
- G. Mirrors: Mirror Glazing Quality, clear-tempered glass mirrors, nominal 6.0 mm thick
- H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation

2.2 PUBLIC-USE WASHROOM ACCESSORIES:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. Bobrick Washroom Equipment, Inc.
 - 3. Bradley Corporation
 - 4. ASI
- B. Toilet Tissue Dispenser: - BY OWNER
 - 1. Jumbo Roll:
 - 2. Single Roll: - BY OWNER
- C. Paper Towel (Folded) Dispenser: - BY OWNER
- D. Liquid-Soap Dispenser: - BY OWNER
- E. Grab Bar:
 - 1. Mounting: Flanges with concealed fasteners

2. Material: Stainless steel, 0.05 inch thick
 - a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area
 3. Outside Diameter: 1-1/2 inches
- F. Sanitary-Napkin Disposal Unit:
1. Mounting: Surface mounted
 2. Basis-of-Design Product: Bobrick No. B-270
- G. Mirror Unit:
1. Frame: Stainless-steel channel
 - a. Corners: Welded and ground smooth
 2. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts
 3. Size: 18" x 24"
 4. Basis-of-Design Product: Bradley – Quad Mount

2.3 WARM-AIR DRYERS:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bobrick Washroom Equipment, Inc.
 2. World Dryer Corporation
 3. Bradley
- B. Warm-Air Dryer:
1. Mounting: Surface mounted
 2. Operation: Motion activated with timed power cut-off switch
 - a. Operation Time: 30 to 40 seconds
 3. Cover Material and Finish: Steel, with white enamel finish
 4. Electrical Requirements: 208-240 V, 9-10 A, 1900-2300 W

2.4 UNDERLAVATORY GUARDS:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Plumberex Specialty Products, Inc.
 2. TCI Products
 3. Truebro, Inc.
- B. Underlavatory Guard:
1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings
 2. Material and Finish: Antimicrobial, molded-plastic, white

2.5 CUSTODIAL ACCESSORIES:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Specialties, Inc.
 2. Bobrick Washroom Equipment, Inc.

3. Bradley Corporation

B. Mop and Broom Holder:

1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf
2. Length: 36 inches
3. Hooks: Three
4. Mop/Broom Holders: Four spring-loaded, rubber hat, cam type
 - a. Material and Finish: Stainless steel, NO. 4 finish (satin)
 - b. Shelf: Not less than nominal 0.05 inch thick stainless steel
 - c. Rod: Approximately 1/4 inch diameter stainless steel

2.6 FABRICATION:

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

3.0 EXECUTION

3.1 INSTALLATION:

Install toilet accessory units in accordance with manufacturer's instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Contractor to provide adequate substrate support for proper installation of toilet accessories. Install units plumb and level, firmly anchored in locations and at heights indicated. Use concealed fasteners where possible. Use tamper proof fasteners where concealed type are not possible.

3.2 ADJUSTING AND CLEANING:

Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

Clean and polish all exposed surfaces after removing labels and protective coatings.

3.3 CLOSE OUT

Turn over keys at end of job per Close-Out procedures.

END OF SECTION 10 28 13

SECTION 13 34 19 METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pre-engineered metal building.

1.2 RELATED WORK

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - A242/A242M-13(2018).....High-Strength Low-Alloy Structural Steel.
 - A653/A653M-20 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron-alloy-Coated (Galvannealed) by the Hot-Dip Process
 - A992/A992M-11(2015)..... Structural Steel Shapes
 - A1008/A1008M-18 Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy
 - A1011/A1011M-18a Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - B209-14.....Aluminum and Aluminum-Alloy Sheet and Plate
 - C553-13(2019).....Mineral Fiber Blanket Thermal Insulation for Commercial and Insulation for Commercial and Industrial Applications
- C. Metal Building Manufacturers Association (MBMA):
 - Recommended Guide Specifications for Pre-Engineered Metal Buildings
 - Recommended Design Practices Manual
- D. American Institute of Steel Construction (AISC):
 - 360-16 Specifications for Structural Steel Buildings
- E. National Fire Protection Association (NFPA):
 - 220-18 Standard Types of Building Construction.
- F. American Welding Society (AWS):
 - D1.1/D1.1M-20 Structural Welding Code-Steel
- G. American Iron and Steel Institute (AISI): Cold Formed Steel Design Manual Latest Edition.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
 - 1. Required Participants:

- a. Owner's Representative.
- b. Architect/Engineer.
- c. Contractor.
- d. Installer.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
 - 2. Include erection drawings and erection manuals showing complete erection layouts.
 - 3. Show steel framing location, panel lengths and markings, and other component parts corresponding with erection sequence and procedures.
 - 4. Show connections with adjoining work.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - a. Metal panels.
 - b. Insulation.
 - c. Sealing materials.
 - d. Steel doors, door frames and hardware interlocking thresholds.
 - e. Windows.
 - 2. Installation instructions.
 - 3. Warranty.
- D. Samples:
 - 1. Wall and roof panels, 600 mm (24 inch) wide by 300 mm (12 inch) high sections, with factory finish in specified colors.
 - 2. Fasteners for wall and roof panels.
- E. Certificates: Certify each product complies products comply with specifications.
 - 1. Zinc coating on steel panels is the specified thickness.
 - 2. Thermal values of roof and wall panels with insulation meet specified requirements.
 - 3. Indicating manufacturers and installers meet qualifications specified.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer with project experience list.
 - 2. Installer with project experience list.
 - a. Welders and welding procedures.
- G. Delegated Design Drawings and Calculations: Signed and sealed by delegated professional structural engineer registered in the state of the project.

1. Include complete structural design analysis for structural components including but not limited computer model input and output and applicable load tables.
 2. Include manufacturer load tables indicating selected panel material, configuration and thickness meets design requirements for spans shown.
- H. Operation and Maintenance Data:
1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Regularly manufactures specified products.
 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
- B. Installer Qualifications: Manufacturer authorized installer.
1. Regularly installs specified products.
 2. Installed specified products with satisfactory service on five similar installations for minimum five years.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND PROTECTION

- A. Stack materials stored on site before erection, covered with suitable weather tight covering. Store metal panels so that any accumulated water will drain off. Do not store panels in contact with materials that might cause staining. Materials having defects or damages that effect appearance, serviceability or use will be rejected.

1.9 FIELD CONDITIONS

- A. Environment:
- B. Field Measurements: Verify field conditions affecting pre-engineered metal building fabrication and installation. Show field measurements on Submittal Drawings.
1. Coordinate field measurement and fabrication schedule to avoid delay.

1.10 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant pre-engineered metal building against material and manufacturing defects and weather intrusion.
1. Warranty Period: Ten years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Building enclosure system consisting of steel framing, metal roof and wall panels, insulation, and other integrated products specified in this section, capable of meeting specified loads and thermal criteria.

2.2 SYSTEM PERFORMANCE

- A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in the state of Georgia.
- B. Design metal buildings complying with specified performance:
 - 1. Load Resistance: Design criteria per.
2018 International Building Code With Georgia Amendments.
 - a. Wind Uplift: Per building code.
 - b. Maximum Deflection:
 - 1) Roof Framing: 1/180 - no ceiling.
 - 2) Roof Panel Vertical Deflection: 1/180.
 - 3) Walls Panel Horizontal Deflection: 1/240.
 - c. Lateral Drift: Maximum 1/200 of building height.
 - 2. Thermal Transmittance:
 - a. Roof Panels: 0,097 U-Value, maximum.
 - b. Wall Panels: 0.184 U-Value, maximum.

2.3 MATERIALS

- A. Steel Framing and Structural Steel Members: ASTM A36 or A242.
- B. Structural Steel Shapes: ASTM A992.
- C. Uncoated steel for light gage members: ASTM A1008 or ASTM A1011.
- D. Panels:
 - 1. Sheet Steel: ASTM A653/A653M, G40 zinc coating, galvanized light gage steel of specified thickness.
 - 2. Aluminum: ASTM B209M (ASTM B209), alloy 3004.
- E. Joint Sealant: Sealant type as recommend by manufacturer appropriate for each type of application.
- F. Sealing Tape: Manufacturer's standard in color to match metal building panels.
- G. Weather strips: Door manufacturer's standard approved products; closed cell neoprene or extruded vinyl.
- H. Thresholds: Aluminum, interlocking type.
- I. Blanket Insulation: Faced blanket insulation, ASTM C553, Type 1 and 2 having a water vapor sorption rating less than 0.2 percent by volume or 5 percent by weight, ASTM C1104.

2.4 PRODUCTS - GENERAL

2.5 FABRICATION

- A. General: Coordinate fabrication and erection of work with related work of other trades. Provide cutouts and supplemental reinforcement as required to accommodate materials and work specified in other sections of the specifications.
- B. Protection of Dissimilar Metals: Separate dissimilar materials not compatible with adjoining materials when exposed to moisture by means of coatings, gaskets, or other effective means.
- C. Steel Framework Fabrication:
 - 1. Coordinate steel framing required for pre-engineered metal building with structural steel shown on Drawings and specified in Section 05 12 00, STRUCTURAL STEEL FRAMING. Shop fabricate columns and related components complete with connection holes for attachment of primary and secondary framing members and bracing.
 - 2. Framing, purlins, girts, struts and miscellaneous steel members required for attachment of pre-engineered metal building panels to building structure to be roll formed members complying with ASTM A1008/A1008M. Design, size, space and install members to meet job and loading conditions. Factory-punch members with holes and furnished complete with angle clips and fastenings required for attaching to structure.
 - 3. Bolted Connections: Ribbed or high-tensile steel bolts as appropriate for each connection.
- D. Wall Panels: Insulating core enclosed between two metal face sheets.
 - 1. Aluminum Sheets: 0.8 mm 0.032 inch thick.
- E. Roof Panels: 0.8 mm 0.032 inch thick.
- F. Design roof panels with grade of steel or aluminum and configuration of cross section capable of withstanding design load conditions without exceeding specified stress and deflection limitations, with same support configuration as that in proposed building. Apply sheets with minimum side lap of minimum one full configuration. Exposed insulation for installation on inside face of roof panels shall be semi rigid insulation.
- G. Flashing, Trim and Closures: Same material, gage and finish as adjacent wall and roof panels. Fastenings as specified for wall and roof panels. Form or mold closure strips to match configuration of the roofing or siding. Install closures wherever necessary to insure weather tight construction.
- H. Louvers: Fabricate wall louvers of same material, gage and finish as face sheets for wall panels. Design louver assembly to prevent infiltration of water into building. Provide insect screens and wire guards on wall louvers except omit insect screens on louvers connected to exhaust ducts.

2.6 FACTORY FINISH AND PAINTING

- A. Factory finish wall and roof panels, including related components, accessories and fastenings, as follows:

1. Prime coat weather faces of wall and roof panels, and related components with epoxy primer, and a finish coat of Polyvinylidene Fluoride baked on coating thickness of (0.8-1.3 mils) with the following performance characteristics.
 - a. Accelerated Weathering Test: ASTM G 153, Method 2, Type D apparatus minimum 2000 hours or Type EH apparatus minimum 500 hours, no checking, blistering or loss of adhesion; color change less than 5 NBS units by ASTM D 2244 and chalking less than No. 8 rating by ASTM D 4214.
 - b. Flexibility: ASTM D 522, Method A, 3 mm 1/8-inch diameter, 180 degree bend, no evidence of fracturing to the naked eye.
 - c. Adhesion: ASTM D 3359, Method B, for laboratory test and film thickness less than 0.01 mm 5 mil and Method A for site tests. Impact: ASTM D 2794, no loss of adhesion after direct and reverse impact equal to 1.5 times metal thickness in mm mils, expressed in m-kg inch-pounds.
 2. Finish on exposed face of liner panel, off white baked enamel suitable as finished surface or as base for field painting.
- B. Steel Framing Members: One coat of shop paint.
- C. Field paint all exterior exposed fastenings to match adjacent panels.
- D. Wire brush abraded surfaces and touch up with same materials as shop prime or finish coat of paint.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Apply barrier coating to aluminum surfaces in contact with dissimilar metals and cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Architecture's consideration.

3.3 ERECTION

- A. Bolt settings and other dimensions to be held to a tolerance of plus or minus 3 mm (1/8 inch). Use templates or other gaging devices to assure accurate spacing of anchor bolts. Bolt field connections unless otherwise shown or specified.
1. Accurately set bases and sill members to obtain uniform bearing and maintain established floor line elevation. Anchors and anchor bolts for securing members to concrete curb or structural steel sub-frame to be of black steel, set accurately to templates and of proper size to adequately resist applicable design loads at base.
- B. Wall Panels: Install wall panels with configurations running in vertical position. Supply panels in single lengths from base to eave with no horizontal joints, except at the junction of door units,

louver panels, and similar openings. End laps for panels minimum 100 mm (four inches). Close walls at base and eave, and around doors, frames, louvers, and other similar openings by flashings and/or formed closures to assure adequate weather tightness. Flashing or stops will not be required where weather-closed or approved self-flashing panels are used.

- C. Roof Panels: Install roof panels with configurations running in direction of roof slope. Provide panels with no transverse joints except at junctions for roof openings and at roof ridge. Lay side laps away from prevailing winds, and seal side laps and end-laps of roof with roof joint sealant. Provide flashing or and sealant at ridge at eaves and rakes at projections through roof, and elsewhere as necessary to make roof weather tight. Accomplish flashing and or caulking in a manner that will assure complete weather-tightness and method to be used, subject to approval by Architect's. Minimum end-laps for roofing and ridge caps for pre-engineered and factory-punched laps shall be 150 mm (6 inches); other minimum end-laps shall be minimum 300 mm (12 inches).
 - 1. Install insulation on interior face of roof sheets or panels as shown on approved shop drawings. Secure materials permanently in place and free of inordinate deflection. Finish work neat, clean, uniform in appearance, and free of noticeable variations in color and texture.
- D. Fasteners for Securing Roof and Wall Panels: Fastening method, size and spacing as recommended by metal building manufacturer and as approved by Architect. Provide non-corrosive fasteners of design that will produce a weathertight connection. Clearly show fasteners and fastening method on shop and erection drawings. Field paint exterior exposed fastenings to match adjacent panels as specified in paragraph, FACTORY FINISH AND PAINTING.
- E. Weatherproofing: Joints between exterior pre-engineered metal building components and other adjacent components and materials, except flashing of metal wall panels and intersecting built-up roofs designed to receive sealing tapes, gaskets, sealant materials, metal flashing and other methods of sealing as required to provide weathertight joints. Workmanship for installing sealants to comply with Section 07 92 00, JOINT SEALANTS. Install joint sealing and guarantee as specified. Color of sealing materials to match adjacent metal building components.

3.4 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed surfaces. Remove contaminants and stains.
- C. Touchup Painting:
 - 1. Prepare and clean substrates according to SSPC-SP 2 or SSPC-SP 3.
 - 2. Touch up damaged factory finishes.
 - 3. Repair galvanized surfaces with galvanized repair paint.
 - 4. Repair painted surfaces with touch up primer.

3.5 ADJUSTING

- A. Adjust doors, windows, and louvers to operate smoothly. Replace those components that do not function as intended.

End of Section 13 34 19

SECTION 22 05 00 – COMMON WORK RESULTS FOR PLUMBING

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. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Escutcheons.
 - 5. Grout.
 - 6. Painting and finishing.
 - 7. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and mechanical platform areas.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. PE: Polyethylene plastic.
 - 4. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support piping to prevent sagging and bending.

1.5 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. No plumbing equipment or piping shall be located within 42" of electrical switchboards or panelboards.
- E. Contractor shall provide the necessary activities to assist and support the Systems Verifier in meeting the requirements of SECTION 019113 – GENERAL REQUIREMENTS FOR SYSTEMS VERIFICATION.

1.7 CODES AND REGULATIONS

- A. All materials and workmanship shall comply with the latest editions of the following codes and standards, as applicable:
 - Manufacturer's Standardization Society (MSS) Standard Practice (SP) 58: Pipe Hangers and Supports - Materials, Design and Manufacture
 - International Building Code, 2018 Edition, with Georgia Amendments
 - International Plumbing Code, 2018 Edition, with Georgia Amendments
 - International Fuel Gas Code, 2018 Edition, with Georgia Amendments
 - All local prevailing City and County codes
- B. All workmanship and materials shall comply with all ordinances and regulations of all local authorities having jurisdiction.
- C. Contractor shall obtain all permits and licenses, and pay all fees, as required for execution of the contract. Arrange for necessary inspections required by City, County, State and other authorities having jurisdiction, and deliver certificates of approval to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
- 2.2 PIPE, TUBE, AND FITTINGS
- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
 - B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.
- 2.3 JOINING MATERIALS
- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
 - B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
 - C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
 - D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
 - E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-soluble flux according to ASTM B 813.
 - F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
 - G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
 - H. Solvent Cements for Joining Plastic Piping:
 - 1. ABS Piping: ASTM D 2235.
 - 2. CPVC Piping: ASTM F 493.
 - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

4. PVC to ABS Piping Transition: ASTM D 3138.

2.4 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Manufacturers:

- a. Cascade Waterworks Mfg. Co.
- b. Dresser Industries, Inc.; DMD Div.
- c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
- d. JCM Industries.
- e. Smith-Blair, Inc.
- f. Viking Johnson.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

- B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

- a. Eslon Thermoplastics.
- b. Spears Mfg. Co.
- c. Georg Fischer Piping Systems - Doublesafe

- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

- a. Thompson Plastics, Inc.
- b. Spears Mfg. Co.
- c. Georg Fischer Piping Systems - Doublesafe

- D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers:

- a. NIBCO INC.
- b. NIBCO, Inc.; Chemtrol Div.
- c. Spears Mfg. Co.
- d. Georg Fischer Piping Systems - Doublesafe

2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Eclipse, Inc.
 - d. Epco Sales, Inc.
 - e. Hart Industries, International, Inc.
 - f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Epco Sales, Inc.
 - d. Watts Industries, Inc.; Water Products Div.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
 - c. Watts Industries, Inc.; Water Products Div.

2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- E. One-Piece, Floor-Plate Type: Cast-iron floor plate.

2.8 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.9 BOLTED CONNECTIONS

- A. Accurately punch, drill or ream bolt holes and remove burrs. Use washers, lock washers, and self-locking nuts as specified on Drawings, and as otherwise required. Tighten all bolts and nuts. Use screw threads conforming to National or Unified forms in accordance with Bureau of Standards Handbook H28. Do not use sheet metal screws. Use machine bolts where access or nuts would not be possible, and where unbolting may be required, in which case utilize sufficient thickness of metal to assure that 2 complete bolt threads are engaged. Secure machine bolts in place by proper lock washers.

2.10 MATERIALS FOR TESTING

- A. All detergents, solvents and other cleaning shall be compatible with the materials of fabrication of the systems, in which they are used. They shall not adversely affect the materials or mechanisms in the systems and they shall be acceptable to equipment manufacturers. All detergents, solvents and other cleaning agents shall also be compatible with the process streams to be handled by the system in which they are used.
- B. Blinds, gaskets, bolts, etc., used in isolating segments of systems shall conform to the specification for adjacent materials.
- C. Contractor shall furnish all labor, tools and equipment required for pressure testing piping systems.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

- f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
- M. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Penetration Fire Stopping".
- N. Verify final equipment locations for roughing-in.
- O. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-soluble flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 4. PVC Nonpressure Piping: Join according to ASTM D 2855.
 5. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.
- E. All equipment shall be installed in strict conformance with manufacturer's recommendations, as specified herein and as shown.
- F. All work provided under this Division shall be installed under the direct supervision of contractors licensed by the State of Georgia.
- G. Plumbing work shall be under the direct supervision of a licensed Master Plumber, Class II.

- H. The supervising license holders shall be identified, and a copy of their current valid license shall be provided as part of the initial submittal package.
- I. License holders shall accompany Engineer on all required job site visits, and shall review and approve in writing, all shop drawings and submittals prior to forwarding to Engineer for review.
- J. Where piping or equipment is exposed to view, special attention shall be given to pipe routing and installation, and the finished installation shall be neat and workmanlike, straight and parallel or perpendicular to the building construction. Piping exposed to view shall be primed and painted as directed by the Architect.
- K. All welders shall be qualified by an independent testing agency and certified in accordance with the requirements of ASME Section IX of the Boiler and Pressure Vessel Code. Contractor shall furnish certification of welder's qualifications with shop drawings.

3.5 ELECTRICAL WORK

- A. All electrical equipment provided under this Division shall comply with the electrical system characteristics present on the site and specified in Division 26.
- B. Motor controls, system controls, starters, pilot lights, push buttons, etc., shall be furnished complete as part of a motor apparatus which it operates, except starters located in the motor control center. All components shall be in conformance with the requirements of the National Electrical Code (2011 Edition) and Division 26.
- C. All power wiring and final connections to the system shall be provided under Division 26.

3.6 PRODUCT HANDLING, DELIVERY AND STORAGE

- A. Receive and handle all materials with care so as not to cause damage. Use padded or strap slings, etc., as appropriate for materials being handled. Lift equipment by lift points provided or recommended by manufacturer.
- B. Use proper tools, equipment and procedures to handle and lay pipe. Do not damage pipe coating, wrapping or linings. Repair or replace damaged pipe coatings, wrappings, or linings in accordance with manufacturer's instructions or as required to restore original protection.
- C. Inspect all materials, upon receipt, for defects and for compliance with Specifications.
- D. Properly store all equipment, pipe, piping materials, etc., so as to prevent deterioration while in storage. Store all materials off ground or off floor. Store inside or cover all materials subject to deterioration from weather.

- E. Store loose materials such as fittings, gaskets, bolts, nuts, small valves, traps, and specialties in adequate number of bins to properly separate. Protect ends of large fittings, valves and pipe from weather and abuse. Properly grease all machined surfaces.

3.7 PAINTING

- A. Factory painted equipment that has been scratched or marred shall be repainted to match original factory color.
- B. Field painting of all uninsulated black ferrous metal items exposed to sight such as equipment hangers, piping, frames and supports not provided with factory prime coat, shall be cleaned and painted with one coat of rust inhibiting primer. In addition, such items in finished spaces shall also be painted with two coats of finish paint in a color to match adjacent surfaces or as otherwise selected by the Architect. Comply with requirements for painting in Division 9, Section "Painting".
- C. All exterior gas piping at the meter, emergency generator and on the roof shall be primed at the time of installation with two coats of rust prohibitive primer. Final painting shall be done after testing is completed and prior to system being placed in service. See Division 9, Section "Painting" for requirements.
- D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 CLEANING AND ADJUSTING

- A. The exterior surfaces of all plumbing equipment, fixtures, fittings, piping, etc., shall be cleaned of all grease, oil, paint and other construction debris.
- B. Start-up and adjustment of all water heaters shall be performed by certified factory representatives of the respective equipment manufacturer.
- C. Equipment controls and other accessories shall be adjusted to provide optimal and efficient operation.

3.9 TESTING

- A. Concealed or insulated piping shall be tested in place before concealing, insulating or covering.
- B. Equipment, materials and instruments required for tests shall be furnished without incurring additions to the Contract.
- C. Refer to the individual specifications sections for specific testing requirements regarding that item.

3.10 SHOP DRAWINGS

- A. Submit shop drawings for approval prior to commencing work. See architectural sections for submittal requirements and format
- B. Submittals shall be supported by descriptive material, such as catalog cuts, diagrams, certified performance curves and charts published by the manufacturer to show conformance to specification and drawing requirements, model numbers alone will not be acceptable. All literature shall clearly indicate the specified model number, dimension, arrangement, options, rating and characteristics of the proposed equipment. Capacities and ratings shall be based on conditions indicated or specified herein. Any deviations from specified equipment shall be clearly noted in red.
- E. The Contractor shall review the information prepared by his suppliers and note any changes required prior to submitting the information to the Engineer.
- F. The Engineer will review the shop drawings for errors in the Contractor's interpretation of the design concept only. Corrections or comments made on shop drawings during review shall not relieve the Contractor from compliance with requirements of the contract documents, plans and specifications. Review of shop drawings shall not relieve the Contractor from the responsibility for conforming and correlating all quantities and dimensions, coordinating his work with that of other trades, and performing his work in a safe and satisfactory manner.
- G. Review of shop drawings shall not permit any deviations from the plans and specifications nor shall it permit changes to the plans and specifications by the Engineer. Changes to or deviations from the contract documents are subject to the provisions of the General Conditions of the contract. Any required changes will then be issued by the Architect and executed by both the Owner and Contractor.
- H. Shop drawings shall be submitted for each of the following items:
 - Plumbing Fixtures & Fittings
 - Valves & Unions
 - Floor Drains
- J. For miscellaneous items not listed here, Contractor shall submit shop drawings for approval, unless the item is to be provided and installed **exactly** as specified, without variance.
- K. Submit evidence of welders' qualifications prior to performing any welds.

3.11 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

3.12 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

3.13 CONSTRUCTION OBSERVATION

- A. Give Architect 2 days notice of all tests and observations.
- B. Conduct all tests to satisfaction of Architect or his authorized representative.
- C. Make site available at all times for observation by Architect. Contractor shall uncover all concealed areas during construction observation.
- D. In addition, the following formal observations by Architect or his authorized representative shall be conducted for each building or part of building and site.
 - 1. Above floor work before being concealed or covered.
 - 2. Final observation after completion of work.

3.14 CLOSEOUT DOCUMENTATION

- A. Close out completion shall be dependent upon satisfactory submittal of the following documents related to this contract:
 - 1. Permits and Certificates of Inspection.
 - 2. Statement certifying that no systems, components or materials employed on the project contain asbestos in any form.
 - 3. Statement certifying that no flux, solder or fittings employed on the project contain lead.
 - 4. Certificate of Insulation Compliance.
- B. Reference Division I - Section "Project Closeout" for general requirements.

3.15 PROJECT RECORD DOCUMENTS

- A. Record drawings shall be submitted that incorporate all changes to the contract, pre-bid and post-bid. Reference each specification section for the required manuals.
- B. Reference Division 1 - Section “Project Closeout” for general requirements.

3.16 OPERATION AND MAINTENANCE DATA

- A. Operation and maintenance manuals shall be submitted for all major plumbing equipment. Reference each specification section for the required manuals.
- B. Reference Division 01 - Section “Project Closeout” for general requirements.

END OF SECTION 22 05 00

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following general-duty valves:
1. Bronze angle valves.
 2. Copper-alloy ball valves.
 3. Ferrous-alloy ball valves.
 4. Bronze check valves.
 5. Gray-iron swing check valves.
 6. Ferrous-alloy wafer check valves.
 7. Spring-loaded, lift-disc check valves.
 8. Bronze globe valves.
 9. Cast-iron plug valves.
 10. Resilient-seated, cast-iron, eccentric plug valves.
- B. Related Sections include the following:
1. Division 02 piping Sections for general-duty and specialty valves for site construction piping.
 2. Division 22 Section "Mechanical Identification" for valve tags and charts.
 3. Division 22 piping Sections for specialty valves applicable to those Sections only.

1.03 DEFINITIONS

- A. The following are standard abbreviations for valves:
1. CWP: Cold working pressure.
 2. EPDM: Ethylene-propylene-diene terpolymer rubber.
 3. NBR: Acrylonitrile-butadiene rubber.
 4. PTFE: Polytetrafluoroethylene plastic.
 5. SWP: Steam working pressure.
 6. TFE: Tetrafluoroethylene plastic.

1.04 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.05 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.9 for building services piping valves.
1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.

- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.
- C. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- F. Valve Actuators:
 - 1. Hand wheel: For valves other than quarter-turn types.
 - 2. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.
 - 3. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.
- G. Extended Valve Stems: On insulated valves.

- H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves and ASME B16.24 for bronze valves.
 - 1. Valve Grooved Ends: AWWA C606.
 - 2. Solder Joint: With sockets according to ASME B16.18.
 - a. Caution: Use solder with melting point below 840 deg F for angle, check, gate, and globe valves; below 421 deg F for ball valves.
 - 3. Threaded: With threads according to ASME B1.20.1.
- I. Valve Bypass and Drain Connections: MSS SP-45.

2.03 BRONZE ANGLE VALVES

- A. Acceptable Manufacturers:
 - 1. Type 1, Bronze Angle Valves with Metal Disc:
 - a. Crane Co.; Crane Valve Group; Stockham Div.
 - b. Hammond Valve.
 - c. Milwaukee Valve Company.
 - d. NIBCO Inc.
 - 2. Type 2, Bronze Angle Valves with Nonmetallic Disc:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Div.
 - d. Anvil International.
 - e. Hammond Valve.
 - f. NIBCO Inc.
 - 3. Type 3, Bronze Angle Valves with Metal Disc and Renewable Seat:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Div.
 - d. Anvil International.
 - e. Milwaukee Valve Company.
- B. Bronze Angle Valves, General: MSS SP-80, with ferrous-alloy hand wheel.
- C. Type 1, Class 150, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.
- D. Type 2, Class 150, Bronze Angle Valves: Bronze body with nonmetallic PTFE or TFE disc and union-ring bonnet.
- E. Type 3, Class 150, Bronze Angle Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

2.04 COPPER-ALLOY BALL VALVES

- A. Acceptable Manufacturers:
 - 1. Two-Piece, Copper-Alloy Ball Valves:
 - a. Conbraco Industries, Inc.; Apollo Div.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Div.
 - e. Anvil International.
 - f. Hammond Valve.

- g. Milwaukee Valve Company.
- h. Watts Industries, Inc.; Water Products Div.
- i. Kitz Valve Company
- j. Nibco

B. Copper-Alloy Ball Valves, General: MSS SP-110.

C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.

2.05 FERROUS-ALLOY BALL VALVES

A. Acceptable Manufacturers:

- 1. Conbraco Industries, Inc.; Apollo Div.
- 2. Cooper Cameron Corp.; Cooper Cameron Valves Div.
- 3. Crane Co.; Crane Valve Group; Stockham Div.
- 4. Hammond Valve.
- 5. Milwaukee Valve Company.
- 6. Nibco

B. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends.

C. Ferrous-Alloy Ball Valves: Class 300, full port.

2.06 BRONZE CHECK VALVES

A. Manufacturers:

- 1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Div.
 - c. Walworth Co.
 - d. Nibco
- 2. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Nibco
- 3. Type 3, Bronze, Swing Check Valves with Metal Disc:
 - a. Crane Co.; Crane Valve Group; Stockham Div.
 - b. Anvil International.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. Walworth Co.
 - f. Watts Industries, Inc.; Water Products Div.

B. Bronze Check Valves, General: MSS SP-80.

C. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

D. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

- E. Type 2, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
- F. Type 2, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
- G. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.
- H. Type 4, Class 150, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

2.07 GRAY-IRON SWING CHECK VALVES

- A. Manufacturers:
 - 1. Type I, Gray-Iron Swing Check Valves with Metal Seats:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Div.
 - d. Anvil International.
 - e. Hammond Valve.
 - f. Milwaukee Valve Company.
 - g. Mueller Co.
 - h. Watts Industries, Inc.; Water Products Div.
 - 2. Type II, Gray-Iron Swing Check Valves with Composition to Metal Seats:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Div.
 - c. Mueller Co.
 - d. Watts Industries, Inc.; Water Products Div.
- B. Gray-Iron Swing Check Valves, General: MSS SP-71.
- C. Type I, Class 250, gray-iron, swing check valves with metal seats.
- D. Type II, Class 250, gray-iron, swing check valves with composition to metal seats.

2.08 FERROUS-ALLOY WAFER CHECK VALVES

- A. Manufacturers:
 - 1. Single-Plate, Ferrous-Alloy, Wafer Check Valves:
 - a. McWane, Inc.; Kennedy Valve Div.
 - b. Mueller Co.
 - c. Tyco International, Ltd.; Tyco Valves & Controls.
 - 2. Dual-Plate, Ferrous-Alloy, Wafer Check Valves:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Div.
 - c. Anvil International.
 - d. Watts Industries, Inc.; Water Products Div.
 - 3. Dual-Plate, Ferrous-Alloy, Wafer-Lug Check Valves:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Gulf Valve Co.
 - c. Valve and Primer Corp.
 - 4. Dual-Plate, Ferrous-Alloy, Double-Flanged-Type Check Valves:
 - a. Crane Co.; Crane Valve Group; Crane Valves.

- b. Gulf Valve Co.
- c. Techno Corp.

- B. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.
- C. Single-Plate, Class 125 or 150, Ferrous-Alloy, Wafer Check Valves: Flangeless body.
- D. Single-Plate, Class 125 or 150, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.
- E. Dual-Plate, Class 250 or 300, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

2.09 SPRING-LOADED, LIFT-DISC CHECK VALVES

- A. Manufacturers:
 - 1. Type I, Wafer Lift-Disc Check Valves:
 - a. Mueller Steam Specialty.
 - 2. Type II, Compact-Wafer, Lift-Disc Check Valves:
 - a. Anvil International.
 - b. Hammond Valve.
 - c. Metraflex Co.
 - d. Milwaukee Valve Company.
 - 3. Type III, Globe Lift-Disc Check Valves:
 - a. Anvil International.
 - b. Hammond Valve.
 - c. Metraflex Co.
 - d. Milwaukee Valve Company.
 - 4. Type IV, Threaded Lift-Disc Check Valves:
 - a. Anvil International.
 - b. Metraflex Co.
 - c. Milwaukee Valve Company.
 - d. Watts Industries, Inc.; Water Products Div.

- B. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.

- C. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.

- D. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.

- E. Type III, Class 125, Globe Lift-Disc Check Valves: Globe style with cast-iron shell and flanged ends.

- F. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

2.10 BRONZE GLOBE VALVES

- A. Manufacturers:
 - 1. Type 1, Bronze Globe Valves with Metal Disc:

- a. Crane Co.; Crane Valve Group; Stockham Div.
 - b. Anvil International.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. Powell, Wm. Co.
 - f. Walworth Co.
2. Type 2, Bronze Globe Valves with Nonmetallic Disc:
 - a. Crane Co.; Crane Valve Group; Stockham Div.
 - b. Anvil International.
 - c. Hammond Valve.
 - d. McWane, Inc.; Kennedy Valve Div.
 - e. Milwaukee Valve Company.
 - f. Powell, Wm. Co.
 - g. Walworth Co.
 3. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:
 - a. Crane Co.; Crane Valve Group; Stockham Div.
 - b. Anvil International.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. Walworth Co.

B. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy hand wheel.

C. Type 1, Class 150, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.

2.11 CAST-IRON PLUG VALVES

A. Manufacturers:

4. Lubricated-Type, Cast-Iron Plug Valves:
 - a. Milliken Valve Co., Inc.
 - b. Nordstrom Valves, Inc.
 - c. Olson Technologies; Homestead Div.
 - d. Walworth Co.
5. Nonlubricated-Type, Cast-Iron Plug Valves:
 - a. General Signal; DeZurik Unit.
 - b. Anvil International.
 - c. Mueller Flow Technologies.
 - d. Tyco International, Ltd.; Tyco Valves & Controls.

B. Cast-Iron Plug Valves, General: MSS SP-78.

C. Class 125 or 150, lubricated-type, cast-iron plug valves.

D. Class 125 or 150, nonlubricated-type, cast-iron plug valves.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

3.02 VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
 1. Shutoff Service: Ball, butterfly, or plug valves.
 2. Throttling Service: Angle, ball, butterfly, or globe valves.
 3. Pump Discharge: Spring-loaded, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Domestic Water Piping: Use the following types of valves:
 1. Angle Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
 2. Angle Valves, NPS 2-1/2 and Larger: Type II, Class 250, cast iron.
 3. Ball Valves, NPS 2 and Smaller: Two-piece, 400-psig CWP rating, copper alloy.
 4. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
 5. Lift Check Valves, NPS 2 and Smaller: Type 2, Class 150, horizontal, bronze.
 6. Swing Check Valves, NPS 2 and Smaller: Type 4, Class 150, bronze.
 7. Swing Check Valves, NPS 2-1/2 and Larger: Type II, Class 250, gray iron.
 8. Spring-Loaded, Lift-Disc Check Valves, NPS 2 and Smaller: Type IV, Class 150.
 9. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 and Larger: Type I or II, Class 250, cast iron.
 10. Gate Valves, NPS 3 and Larger: Type I, Class 250, OS&Y bronze-mounted cast iron.
 11. Globe Valves, NPS 2 and Smaller: Type 2, Class 150, bronze.
 12. Globe Valves, NPS 2-1/2 and Larger: Type I, Class 250, bronze-mounted cast iron.
 13. Plug Valves, NPS 2 and Larger: Class 125 or 150, lubricated-type with FDA-approved-material sealant, cast iron.

3.03 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
- G. Lift Check Valves: With stem upright and plumb.
- H. Install solenoid valves with coil/control operator upright in an accessible location with proper clearances for maintenance.

3.04 JOINT CONSTRUCTION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-soluble, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.05 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

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. This Section includes the following hangers and supports for mechanical system piping and equipment:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Fastener systems.
 - 5. Equipment supports.
 - 6. Intermediate pipe supports
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze pipe hangers. Include Product Data for components.
 - 2. Metal framing systems. Include Product Data for components.
 - 3. Equipment supports.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." AWS D1.3, "Structural Welding Code--Sheet Steel." AWS D1.4, "Structural Welding Code--Reinforcing Steel. "ASME Boiler and Pressure Vessel Code: Section IX.

- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.2, "Structural Welding Code--Aluminum."
 - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
 - 5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.
 - 3. Grinnell Corp.
 - 4. PHD Manufacturing, Inc.
- C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
 - 3. Unistrut Corp.; Tyco International, Ltd.

- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Hilti, Inc.
 - c. Powers Fasteners.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes. All supplementary supporting steel for work under this Division shall be provided under this Division of the specifications in accordance with the plans and accepted practices.

2.7 INTERMEDIATE PIPE SUPPORTS

- A. Pipe Stands, General: Shop or field fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Adjustable, low type, manufactured pipe stand assembly consisting of a plastic base unit with two vertical 1/2" galvanized threaded steel rods with nuts and washers adjustable to a minimum of 10" high with horizontal roller strut support with contours for supporting pipe.
 - 1. Manufacturers:
 - a. Miro Industries model 3-RAH-12
 - b. PHP Systems and Design SS8-R.
 - c. MAPA Products MS-3RA12
 - d. Portable Pipe Hangers model PP10

2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching or vibration in noise sensitive areas.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 8.
 - 2. Adjustable swivel ring hangers are not acceptable for use on this project.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 10.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. C-Clamps (MSS Type 23): For structural shapes.
 - 6. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 - 7. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 - 8. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

- 1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- O. Install a minimum 18"x18" section of room membrane under each intermediate pipe support on roof.

3.2 HANGER AND SUPPORT INSTALLATION

A. SUSPENDED HORIZONTAL PIPING

- 1. Support Spacing:

<u>NOMINAL PIPE SIZE</u>	<u>MATERIAL</u>	<u>MAXIMUM SPACING OF SUPPORTS □ FT.</u>
Up through 1-1/2"	Steel & Copper	6'-0"
2" through 8"	Steel & Copper	8'-0"
3" through 5"	Cast Iron	5'-0"
6" and above	Cast Iron	5'-0"
All sizes	Plastic	4'-0"
- 2. In addition to the above maximum spacing requirements, hangers and supports shall be installed within 18" of each change in direction, regardless of pipe size or material.
- 3. Provide all hangers and rods, turnbuckles, angles, channels and other structural supports to support the piping systems. Rods for pipe hangers shall be as follows:

<u>HANGER ROD DIAMETER</u>	<u>PIPE SIZE</u>
3/8"	2" and smaller
1/2"	2-1/2" and 3"
5/8"	4" and 5"
3/4"	6"
- 4. Intermediate pipe supports provided between building structural members so as not to exceed maximum support spacing specified from top chord of framing joist shall be structural steel angles (minimum 2-1/2" X 2-1/2" X 1/4").
- 5. All ferrous metal pipe hangers and supplemental steel shall be provided with factory applied coat of rust inhibitive paint, plating or galvanizing.
- 6. Pipe hangers for suspending the following horizontal insulated piping shall be sized to fit around the pipe, pipe insulation and pipe insulation protective shields.
 - a. Cold water piping
 - b. Domestic hot water supply and recirculating piping
- 7. All supporting equipment shall be designed with a minimum factor of safety of five based on the ultimate tensile strength of the materials employed.

- B. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

- C. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- E. Fastener System Installation:
 - 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- M. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

4. Shield Dimensions for Pipe:
 - a. Provide galvanized sheet metal pipe insulation protection shields at each pipe hanger for all horizontal insulated water pipes and condensate drain pipes. Shield sizes shall be:
 - 1) Pipes 2" and smaller: 18 gauge X 12" long
 - 2) Pipes 2-1/2" and larger: 16 gauge X 18" long
 - b. Shields shall be 180 degree type at all pipe hangers, except that on trapeze hangers, pipe rack and on floor supported horizontal pipe shields shall be 360 degree type. For pipe sizes 2-1/2" and larger, use Foamglass inserts at all shields, hangers, sleeves, etc.
5. Pipes NPS 2-1/2" and Larger: Include wood or foamglass inserts.
6. Insert Material: Length at least as long as protective shield.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.
- C. Roof pipe supports adjustments: Adjust gas pipe supports to distribute loads equally and adjust elevation to achieve a level of pipe installation between permanent/seismic pipe anchors.

3.6 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 painting Sections.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 220529

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

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. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment labels.
 - 2. Pipe markers.
 - 3. Valve tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Valve numbering scheme.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

1.6 EQUIPMENT TO BE IDENTIFIED

- A. Provide equipment identification for the following:
 - 1. Domestic electric water heaters. (DWH-...)
 - 2. Domestic gas water heaters. (GWH-...)
 - 3. Domestic hot water circulating pumps. (CP-...)
 - 4. Domestic water system tempering valves. (TV-...)
 - 5. Trap primer distribution units. (TPDU-...)
 - 6. Trap primer units located above ceilings. TP-...

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Labels: 2" high black film adhesive backed letters.
 - 1. Data:
 - a. Name and plan number.
 - 2. Location: Accessible and visible.

2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
 - 1. Colors: Comply with ASME A13.1, unless otherwise indicated.
 - 2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 - 3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
 - 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 - 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Self-Adhesive Pipe Markers not acceptable.
- C. Plastic Tape not acceptable.
- D. Acceptable Manufacturers:
 - 1. T&B/ Westline
 - 2. Seton
 - 3. MSI (Marking Services, Inc.)
 - 4. Brimar Identification & Safety Products
 - 5. Brady Worldwide, Inc.

2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme. Provide 5/32-inch hole for fastener.
 - 1. Material: 19-gauge minimum brass, 1-1/2" minimum size.
 - 2. Valve-Tag Fasteners: Self locking cable ties.
- B. Acceptable Manufacturers:
 - 1. T&B/ Westline
 - 2. Seton
 - 3. MSI (Marking Services, Inc.)
 - 4. Brimar Identification & Safety Products
 - 5. Brady

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 22 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
 - 1. Pipes with OD, Including Insulation, Less Than 4 Inches: Snap-on/self-coiling pipe markers. Use color-coded markers lapped at least 1-1/2 inches at both ends of pipe marker and covering full circumference of pipe.
 - 2. Pipes with OD, Including Insulation, 4 Inches and Larger: Snap-on/self coiling pipe markers. Use color-coded markers with permanent nylon fastener straps, one on each end.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and non-accessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 20 feet along each run or otherwise at each wall.
 - 7. Pipe markings on piping more than 7'-0" above floor shall be rotated to allow full observation from floor.
- C. Band and letter sizes shall conform to the following table:

<u>O.D. of Piping of Covering:</u>	<u>Width of Color Band</u>	<u>Size of Letter/Numbers</u>
1" and smaller	6"	1/2"
1-1/4" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" and larger	18"	2"

- D. Band legend and color and letter color shall conform to the following table:

<u>Piping</u>	<u>Band Legend</u>	<u>Letters</u>	<u>Band Color</u>
Non-Potable Water	NPW	White	Green
Natural Gas	G	Black	Yellow
Medium Pressure Gas	MPG	Black	Yellow
Domestic Cold-Water	CW	White	Green

Domestic Hot Water	HW	Black	Yellow
Domestic Circulating	HWC	Black	Yellow
Sanitary Waste Drain	W	White	Green
Sanitary Soil Drain	S	White	Green
Sanitary Vent	V	White	Green
Sprinkler Piping	SPK	White	Red
Rainwater/Downspouts	DS	White	Green
Overflow Drain Piping	OFD	White	Green
Chilled Water Supply	CWS	White	Green
Chilled Water Return	CWR	White	Green
Hydronic Hot Water Supply	HWS	Black	Yellow
Hydronic How Water Return	HWR	Black	Yellow
Condensate Drain	DRAIN	White	Green

3.3 VALVE-TAG INSTALLATION

A. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

<u>SYSTEM</u>	<u>IDENTIFICATION SHAPE</u>	<u>NUMBERS</u>
Cold Water (Domestic)	Round	CW-1,2,3.....
Hot Water (Domestic)	Round	HW-1,2,3.....

2. Each valve tag shall be attached to the hand wheel or lever handle with jack chain or “S” hooks.
3. A valve chart, framed under glass and wall mounted, shall be located in the main mechanical room and shall list each valve by identification number, its location in the piping system - (i.e., hot water, fire main, water heater, etc.) and its function -(i.e., shut-off, balancing, drain, etc.).
4. Gas valves at the meter, the emergency gas generator, and on the roof shall not have valve tags.
5. All ceiling tiles which provide access to valves shall have a color-coded valve identification number affixed to the permanent ceiling grid immediately below the valve or a 1/2” high black stencil on clear background from a label maker manufactured for that purpose.

3.4 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.5 CLEANING

A. Clean faces of mechanical identification devices.

3.6 UNDERGROUND PIPING IDENTIFICATION

- A. All underground acid resisting waste piping installed outside the building pad shall have continuous warning identification tape installed 12" above the top of the pipe and a minimum of 6" below finished grade.
- B. All underground acid resisting waste piping shall have a continuous # 10 copper tracer wire installed on the top of the pipe and attached with cable ties on 6' centers maximum spacing and within 12" from tees, branch connections and manufactured elbows.

END OF SECTION 220553

SECTION 220700 - PLUMBING INSULATION

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. This Section includes plumbing insulation for equipment and pipe, including the following:
 - 1. Insulation Materials:
 - a. Cellular glass.
 - b. Flexible elastomeric.
 - c. Mineral fiber.
 - d. Polyolefin.
 - 2. Adhesives.
 - 3. Mastics.
 - 4. Sealants.
 - 5. Factory-applied jackets.
 - 6. Field-applied fabric-reinforcing mesh.
 - 7. Field-applied jackets.
 - 8. Tapes.

1.3 DEFINITIONS

- A. ASJ: All-service jacket.
- B. FSK: Foil, scrim, kraft paper.
- C. FSP: Foil, scrim, polyethylene.
- D. SSL: Self-sealing lap.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. Shop Drawings: Show details for the following:
 - 1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Insulation application at pipe expansion joints for each type of insulation.
 - 3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 4. Removable insulation at piping specialties, equipment connections, and access panels.
 - 5. Application of field-applied jackets.
 - 6. Application at linkages of control devices.
 - 7. Field application for each equipment type.

- C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment".
- B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 INSULATION MATERIALS

- A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.

- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
 - 1. Products:
 - a. Cell-U-Foam Corporation; Ultra-CUF.
 - b. Pittsburgh Corning Corporation; Foamglas Super K.
 - 2. Block Insulation: ASTM C 552, Type I.
 - 3. Special-Shaped Insulation: ASTM C 552, Type III.
 - 4. Board Insulation: ASTM C 552, Type IV.
 - 5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - 1. Products:
 - a. Aeroflex USA Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
- H. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000 Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
- I. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
 - 1. Products:
 - a. Armacell LLC; Tubolit.
 - b. Nomaco Inc.; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.

- c. RBX Corporation; Therma-cell.
- J. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II and ASTM C1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements:
 - a. CertainTeed Corp.; Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; All-Service Duct Wrap.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Cellular-Glass, Phenolic-Foam, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
 - 1. Products:
 - a. Childers Products, Division of ITW; CP-96.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-33.
 - c. Pittsburgh-Corning
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. Products:
 - a. Aeroflex USA Inc.; Aero seal.
 - b. Armacell LCC; 520 Adhesive.
 - c. Foster Products Corporation, H. B. Fuller Company; 85-75.
 - d. RBX Corporation; Rubatex Contact Adhesive.
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
 - 1. Products:
 - a. Dow Chemical Company (The); 739, Dow Silicone.
 - b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 - c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Red Devil, Inc.; Celulon Ultra Clear.
 - e. Speedline Corporation; Speedline Vinyl Adhesive.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
 - 1. Products:
 - a. Childers Products, Division of ITW; CP-35.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-90.
 - c. ITW TACC, Division of Illinois Tool Works; CB-50.
 - d. Marathon Industries, Inc.; 590.
 - e. Mon-Eco Industries, Inc.; 55-40.
 - f. Vimasco Corporation; 749.
 - 2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
 - 5. Color: White.

2.5 SEALANTS

- A. Joint Sealants:
 - 1. Joint Sealants for Cellular-Glass Products:
 - a. Childers Products, Division of ITW; CP-76.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-45.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
 - f. Vimasco Corporation; 750.
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Permanently flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 100 to plus 300 deg F.
 - 5. Color: White or gray.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.

2.8 FIELD-APPLIED JACKETS AND FITTING COVERS

- A. Field-applied jackets and fitting covers shall comply with ASTM C 921, Type I, unless otherwise indicated.

- B. PVC Jacket/fitting cover: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Products:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto PVC Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.
 - 1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
 - b. Compac Corp.; 104 and 105.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 - 2. Width: 3 inches.
 - 3. Thickness: 11.5 mils.
 - 4. Adhesion: 90 ounces force/inch in width.
 - 5. Elongation: 2 percent.
 - 6. Tensile Strength: 40 lbf/inch in width.
 - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Products: Subject to compliance with requirements:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - b. Compac Corp.; 110 and 111.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
 - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
 - 2. Width: 3 inches.
 - 3. Thickness: 6.5 mils.
 - 4. Adhesion: 90 ounces force/inch in width.
 - 5. Elongation: 2 percent.
 - 6. Tensile Strength: 40 lbf/inch in width.
 - 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 - 1. Products: Subject to compliance with requirements:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - b. Compac Corp.; 120.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
 - d. Venture Tape; 3520 CW.
 - 2. Width: 2 inches.

3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 COMMON INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. All domestic water piping in walls and chases shall be insulated unless otherwise noted on plans.
- Q. All horizontal rainwater/downspout and overflow roof drain piping installed overhead in spaces exposed to view shall be insulated as specified for domestic water piping. Pipe shall be entirely

wrapped with glass fiber mesh wrap and coated with two coats of waterproof mastic and made ready for final painting.

- R. All domestic hot and cold-water lines installed below the ceiling at the kitchen cooking line hood shall be insulated and enclosed in a continuous aluminum jacket with factory manufactured preformed fittings and tees where not concealed.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Firestopping and fire-resistive joint sealers are specified in Division 07 Sections "Penetration Firestopping" and "Fire-Resistive Joint Systems".
- C. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies according to Division 07 Section "Penetration Firestopping".

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting covers with insulation material and density equal to adjacent straight piping sectional insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend Insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 CELLULAR-GLASS INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by in

sulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

- B. Insulation Installation on Pipe Flanges:
 - 1. Install preformed pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
 - 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install preformed sections of same material and density as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 - 2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed sections of cellular-glass insulation to valve body.
 - 2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 3. Install insulation to flanges as specified for flange insulation application.

3.7 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturers' recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 - 4. Secure insulation to flanges and seal seams with manufacturers' recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install mitered sections of pipe insulation.
 - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
 1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 4. Install insulation to flanges as specified for flange insulation application.
- E. Blanket Insulation Installation on rainwater, downspout and overflow drain piping and sumps (where piping is not exposed to view):
 1. Secure with FSK tape and wire at 36" intervals along entire horizontal run of insulation.
 2. Secure roof drain sump insulation with FSK tape. All metal surfaces of roof drain body, inclusive of under deck clamps shall be insulated.
 3. Tape applied to longitudinal seams shall be continuous.

4. Horizontal downspout and overflow drain piping shall be insulated from underside of roof deck to 12" beyond elbow turned down in wall or chase.
- F. Insulation Installation on rainwater, downspout and overflow drain piping and sumps (where piping is exposed to view):
1. Insulate and finish piping the same as for domestic water piping system with the following additions:
 - a. Glass fiber mesh tape shall be wrapped continuous around the insulation cover throughout the entire pipe length.
 - b. Insulation surface shall have two coats of waterproof mastic applied.

3.9 POLYOLEFIN INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Seal split-tube longitudinal seams and end joints with manufacturers' recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturers' recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of polyolefin pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
 2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.10 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturers' recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.
- E. Where PVDC jackets are indicated, install as follows:
1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
 2. Wrap factory pre-sized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install pre-sized jacket with an approximate overlap at butt joint of 2 inches over the previous section.
 3. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
 4. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
 5. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
 6. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.11 FINISHES

- A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.12 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Below-grade piping. (Except copper piping shall have protective sleeve or coating).
 - 2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.
 - 3. Pipe risers to water hammer arrestors/shock absorbers above ceiling.
 - 4. Trap Primer piping from distribution unit to drains on traps.

3.13 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
 - 1. 4" and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
- B. Domestic Hot and Recirculated Hot Water:
 - 1. Pipe size < 1-1/2": Insulation shall be the following:
 - a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
 - 2. Pipe size 1-1/2" < 4": Insulation shall be the following:
 - a. Mineral-Fiber Pipe Insulation, Type I: 1-1/2 inch thick.
- C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
 - 1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 1/2 inch thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
 - c. Polyolefin: 1/2 inch thick.
- D. Condensate and Equipment Drain Water below 60 Deg F:
 - 1. All Pipe Sizes: Insulation shall be the following:
 - a. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
- E. Overhead Floor Drains, Traps, and Sanitary Drain Piping within 5 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
 - 1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 1/2 inch thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
- F. Rainwater/Downspout and Overflow drain piping above ceilings inclusive of roof and overflow drain sumps.
 - 1. All pipe sizes: Insulation shall be the following:

- a. Blanket fiberglass insulation 1-1/2" thick.
- b. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick. (where exposed to view)

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
 - 1. PVC: 20 mils thick.
 - 2. Aluminum, Smooth or Corrugated: 0.020 inch thick.

END OF SECTION 220700

SECTION 221116 - DOMESTIC WATER PIPING

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. This Section includes domestic water piping inside the building.
- B. Related Sections include the following:
 - 1. Division 02 Section "Water Distribution" for water-service piping outside the building from source to the point where water-service piping enters the building.
 - 2. Division 22 Section "Meters and Gages" for thermometers, pressure gages, and fittings.
 - 3. Division 22 Section "Domestic Water Piping Specialties" for water distribution piping specialties.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

- A. Water Samples: Specified in Part 3 "Cleaning" Article.
- B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.

- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
 - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
 - 4. Manufacturers:
 - a. Cambridge Lee
 - b. Howell Metal
 - c. Cerro Flow Products
- B. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
 - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
 - 4. Manufacturers:
 - a. Cambridge Lee
 - b. Howell Metal
 - c. Cerro Flow Products
- C. Wrought Copper and Copper Alloy Solder Joint Pressure Fittings:
 - 1. Copper Pressure Fittings: ASME/ANSI standard B16.18 cast copper-alloy or ASME B16.22, wrought-copper solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Wrought-copper fittings must be NSF/ANSI 61 registered.
 - a. Cello Products
 - b. Elkhardt Products
 - c. Mueller Industries
 - 3. Press fitting joints may be used for pipe sizes 2-1/2" and larger.

2.3 VALVES

- A. Bronze and cast-iron, general-duty valves are specified in Division 22 Section "Plumbing Valves."
- B. Balancing and drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfilling for work included in Division 22 of the specifications.

3.2 EXCAVATION

- A. Excavations shall be performed in strict accordance with latest OSHA regulations. Sheeting, bracing, barricades and fencing shall be installed wherever necessary to avoid undue hazards to workmen or passersby.
- B. During excavation, material shall be piled at a distance from the banks of the excavation that will avoid overloading and will prevent slides and/or cave-ins. Water accumulating in excavations shall be removed by pumping. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled under sidewalks and curbs where pipe can be installed as specified and back-fill can be tamped. All trenches and pit excavations shall be shored and/or braced as required to prevent slides and/or cave-ins.
- C. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and the making of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded. Over-depths shall be backfilled as specified and with materials for backfilling as specified.

3.3 BACKFILLING

- A. The trenches shall not be backfilled until all required pressure and/or leak tests on piping are performed and until the mechanical systems as installed conform to requirements specified in the several sections covering the installation of the various systems. Trenches shall be backfilled to the ground surface with clean, selected excavated material or other material that meets compaction requirements and as hereinafter specified. Pavement and base course disturbed by trenching operation shall be restored to its original condition.
- B. Backfill material shall be deposited in 6-inch thick layers and compacted with mechanical tamps to the density of the adjacent soil or grade until there is a cover of not less than 2 feet over pipes. The backfill material in this portion of the trench shall consist of earth, sandy clay, soft shale, or other materials free from objects larger than 1 inch in any direction.
- C. The remainder of the trench shall be backfilled with clean, select material that is free of stones larger than 3 inches in any direction. Backfill material shall be deposited in layers not exceeding 6 inches thick, and each layer shall be compacted mechanically. Settling of granular, non-cohesive material with water will be permitted. The surface shall be mounded over for settling and left in a uniform condition.

3.4 COMPACTION AND TESTING

- A. Areas under building locations, paving, walks or other structures which may be placed on site at a future date shall be compacted to 95% minimum dry proctor.

3.5 PIPE AND FITTING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Domestic Water piping from street main/meter to building:
 - 1. Type K hard copper tube with wrought copper fittings; pipe size 2-1/2" and smaller
 - 2. Ductile iron pipe and fittings; pipe size 3" and larger
 - 3. Schedule 80 PVC pressure pipe with schedule 80 solvent weld fittings; pipe size 2-1/2" and smaller, upon approval by FCS Facilities.
 - a. Install continuous #12 bare copper wire on top of pipe along entire length affixed to pipe with plastic tie straps a maximum of 4' on center
 - b. Install continuous buried warning identification tape 12" above top of pipe in trench
 - 4. All underground pressure piping shall be thrust blocked at all changes of direction and changes in elevation
 - 5. Saddle tees are not permitted in any portion of the underground piping system
- D. Under-Building-Slab, Water-Service Piping on Service Side of Water Meter: Refer to Division 2 Section "Water Distribution."
- E. Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, NPS 3/4" and Smaller: Soft copper tube, Type K; copper pressure fittings; no joints below slab.
- F. Aboveground Domestic Water Piping: Use the following piping materials:
 - 1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 - 2. Press fitting joints may be used for pipe sizes 2-1/2" and larger only.
- G. Non-Potable-Water Piping: Use the following piping materials for each size range:
 - 1. 1-1/2 and Smaller: Soft copper tube, Type K; copper pressure fittings; and soldered joints. No joints below slab.

3.6 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use bronze ball valves for piping 3" and smaller.
 - 2. Throttling Duty: Use full port bronze ball valves for piping 2" and smaller.
 - 3. Hot-Water-Piping, Balancing Duty: Memory-stop balancing valves.
 - 4. Drain Duty: Hose-end drain valves.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use full port ball valves for piping 3" and smaller.
- C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
 - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
 - 2. Install stop-and-waste drain valves where indicated.

- D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping 2" and smaller. Balancing valves are specified in Division 22 Section "Domestic Water Piping Specialties."

3.7 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing"
- B. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."
- C. Install steel pipe sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 22 Section "Common Work Results for Plumbing."
- E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Pressure gages are specified in Division 23 Section "Meters and Gages," and drain valves and strainers are specified in Division 22 Section "Plumbing Specialties."
- F. Install water-pressure regulators downstream from shutoff valves. Water-pressure regulators are specified in Division 22 Section "Domestic Water Piping Specialties."
- G. Install domestic water piping level and plumb.

3.8 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Soldered Joints: Use ASTM B 813, water-soluble, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- C. Press Fit Joints: Copper press fit fittings shall conform to the material requirements of ASME B16.18 or ASME B16.22. Sealing elements for press fittings shall be EPDM and factory installed. Press ends shall feature a design that indicates press stop to ensure sealing element has full penetration prior to compression operation.

3.9 HANGER AND SUPPORT INSTALLATION

- A. Pipe hanger and support devices are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1-1/2: 72 inches with 3/8-inch rod.
 - 3. NPS 2 thru NPS 3: 96 inches with 1/2-inch rod.
 - 4. NPS 4 thru NPS 6: 96 inches with 5/8-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:
 - 1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Plumbing Fixtures."
 - 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.11 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected, tested and approved by authorities having jurisdiction (AHJ), the Owner, and the Building inspections department.
 - 2. Notification of Inspections shall include the Architect, Engineer, Building Inspections Department (AHJ) and the Owner. A notification of at least 48 hours shall be given before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction. All reports shall be submitted to the Architect with any required corrective action listed once test is completed.
- B. Test domestic water piping as follows:
1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four (4) hours. Leaks and loss in test pressure constitute defects that must be repaired.
 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.

3.12 ADJUSTING

- A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
 2. Open shutoff valves to fully open position.
 3. Open throttling valves to proper setting.
 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.13 CLEANING

- A. Contractor shall provide signage at all potable water outlets where systems or portions of systems are being tested with date and duration of test(s) prior to commencement of disinfection procedure. Notification of system cleaning shall be sent to the Architect's office 24 hours prior to actual performance of work. A copy of the biological examination of the test results shall be sent to the Architect's office for review and approval.
- B. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

- b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours. Open and close all valves in system several times during the retention period.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time. Open and close all valves in the system several times during the flushing period.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

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. This Section includes the following domestic water piping specialties:
 - 1. Vacuum breakers.
 - 2. Backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Balancing valves.
 - 5. Temperature-actuated water mixing valves.
 - 6. Individual tempering valves.
 - 7. Strainers.
 - 8. Outlet boxes.
 - 9. Hose bibbs.
 - 10. Wall hydrants.
 - 11. Drain valves.
 - 12. Water hammer arresters.
 - 13. Trap-seal primer valves.
 - 14. Individual fixture water tempering valves.
- B. Related Sections include the following:
 - 1.
 - 2. Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Compliance:

1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cash Acme.
 - b. Conbraco Industries, Inc.
 - c. Zurn Plumbing Products Group; Wilkins Div.
 2. Standard: ASSE 1001.
 3. Size: As required to match connected piping.
 4. Body: Bronze.
 5. Inlet and Outlet Connections: Threaded or sweat.
 6. Finish: Chrome plated.
- B. Hose-Connection Vacuum Breakers:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cash Acme.
 - b. Conbraco Industries, Inc.
 - c. Woodford Manufacturing Company.
 2. Vacuum breakers shall be provided on all outlets threaded for hose ends. Vacuum breakers shall be the screw on vandal proof type with hose outlet threads.

2.2 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Zone (RPZ) Backflow Preventers:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Co.
 - b. Conbraco Industries, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Wilkins
 2. Reduced Pressure Zone Backflow Preventers shall be ASSE and USC approved reduced pressure backflow preventers with integral strainer, threaded ends with union connections, all bronze construction, with required test cocks, quarter turn ball valves and required air gap fitting for relief valve discharge. Devices shall not be installed above ceilings or directly over electrical equipment or controls. In the event of a reduced pressure zone relief valve discharging non-potable water (in a back pressure, back siphonage, pressure fluctuation or fouled check condition), water will be spilled onto equipment below.
 3. Route funnel drain piping full size from air gap fitting to floor drain with minimum 2% pitch.
 4. Provide and install a full-size ball valve, and resilient seat check valve immediately upstream of the assembly, to relieve nuisance tripping of the relief valve.
- B. Dual-Check-Valve Backflow Preventers:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Cash Acme.
 - b. Conbraco Industries, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
2. Dual Check Valves shall be ASSE approved dual check valve backflow preventers, bronze constructed with dual check assemblies and replaceable seals and union end.
- C. Hose-Connection Backflow Preventers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Woodford Manufacturing Company.
 2. Standard: ASSE 1052.
 3. Operation: Up to 10-foot head of water back pressure.
 4. Inlet Size: NPS 3/4.
 5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
 6. Capacity: At least 3-gpm flow.

2.3 WATER PRESSURE-REDUCING VALVES

- A. Water Regulators:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cash Acme.
 - b. Conbraco Industries, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
 2. Standard: ASSE 1003.
 3. Pressure Rating: Initial working pressure of 150 psig.
 4. Size: As shown on plans.
 5. Body: Bronze body construction with removable strainer, threaded connections and renewable seats. Provide stainless steel spring, stainless steel adjusting screw and stainless-steel screws and fasteners throughout.
 6. Flow rates and reduced pressure fall-off shall be within limits set by the applicable plumbing code.

2.4 BALANCING VALVES

- A. Copper-Alloy Calibrated Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ITT Industries; Bell & Gossett Div. – circuit setter plus
 - b. Taco - Accu-flo
 - c. Armstrong – CBV-S
 2. Type: Ball valve with differential readout ports, internal EPT inserts, check valve, and memory stop with name plate for set point feature. Valve shall be leak tight at full rated working pressure of 175 psig at 250 degrees.
 3. Body: Brass or bronze.
 4. Size: Same as connected piping, but not larger than NPS 2.

2.5 THERMOSTATIC WATER MIXING VALVES (TV)

- A. Water-Temperature Limiting Devices:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Conbraco Industries, Inc.
 - b. Leonard Valve Company.
 - c. Powers; a Watts Industries Co.
 - d. Symmons Industries, Inc.
 - e. Lawler Mfg. Co.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 110 deg F.
9. Tempered-Water Design Flow Rate: As shown on plans.
10. Valve Finish: Rough bronze
11. Unit shall be factory tested.
12. Install per manufacturers' recommendations.
13. Install thermometer, if not part of unit, on tempered water discharge line.

2.6 INDIVIDUAL FIXTURE, WATER TEMPERING VALVES

A. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lawler Manufacturing Company, Inc. – 911E/F
 - b. Leonard Valve Company. – TA-300
 - c. Powers; a Watts Industries Co. – ES 150
2. Standard: ASSE 1071 and ANSI Z358.1, thermostatically controlled water tempering valve.
3. Pressure Rating: 125 psig minimum, unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: 60-95 degree F. range adjustable with internal cold water bypass.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 85 deg F.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

2.8 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Guy Gray Manufacturing Co., Inc.
 - b. Oatey.
 - c. Plastic Oddities; a division of Diverse Corporate Technologies.
 - d. Watts Industries, Inc.; Water Products Div.
 2. Mounting: Recessed.
 3. Material and Finish: Enameled-steel or epoxy-painted-steel box and faceplate. Metal boxes shall be installed in rated walls with boxes rated for that installation.
 4. Valves: Combination, valved fitting or separate hot- and cold-water, valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
 5. Supply Shutoff Fittings: NPS ½ globe, or ball valves and NPS ½ copper, water tubing.
 6. Drain: NPS 2 stand-pipe and P-trap for direct waste connection to drainage piping.
 7. Inlet Hoses: Two 60-inch- long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
 8. Drain Hose: One 48-inch- long, rubber household clothes washer drain hose with hooked end routed to filter box prior to spilling into outlet box.
- B. Icemaker Outlet Boxes:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acorn Engineering Company.
 - b. Oatey.
 - c. Plastic Oddities; a division of Diverse Corporate Technologies.
 2. Mounting: Recessed.
 3. Material and Finish: Enameled-steel or epoxy-painted-steel or plastic box and faceplate. Metal boxes shall be installed in rated walls with boxes rated for that installation.
 4. Valve: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 or smaller copper tube outlet.
 5. Supply Shutoff Fitting: NPS 1/2 globe, or ball valve and NPS 1/2 copper, water tubing.
- C. Washing Machine Filter Boxes:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Filtrol 160
 - b. Oatey Plumbing Products
 - c. Environmental Enhancements model LUV-R
 2. Mounting: Surface mount on wall bracket.
 3. Material: Plastic filter enclosure and removable top.

2.9 HOSE BIBBS

- A. Hose Bibbs (HB):
1. Standard: ASME A112.18.1 for sediment faucets.
 2. Body Material: Bronze.
 3. Seat: Bronze, replaceable.
 4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
 5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.

6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Mechanical Closets or Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.10 WALL HYDRANTS

A. Exterior Non-freeze Wall Hydrants (NFWH):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Woodford Manufacturing Company
 - e. Watts Industries
 - f. Wade Industries
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, cast bronze, flush mounting with cast bronze cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): One with each wall hydrant.

B. Interior Wall Hydrants (WH):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Woodford Manufacturing Company.
 - e. Watts Industries
 - f. Wade industries
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants, less non-freeze features.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Inlet: NPS 3/4.

6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, cast bronze, flush mounting with cast bronze cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): One with each wall hydrant.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.12 WATER HAMMER ARRESTERS

A. Water Hammer Arresters (WHA or SA):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Zurn Plumbing Products Group; Specification Drainage Operation.
 - d. Watts Industries
 - e. PPP Inc. SBHA series
2. Standard: PDI-WH 201.
3. Type: Metal bellows.
4. Size: PDI-WH 201, Sizes A through F.

2.13 TRAP-SEAL PRIMER VALVES (TP)

A. Supply-Type, Trap-Seal Primer Valves, electronically operated delivering potable water across an air gap funnel:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.; M1-200-24V
 - b. PPP Inc.; SP-500-24V
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
8. Distribution units shall be compatible with manufactured product and include 1/2" compression connections for trap primer piping downstream of unit.

9. See plans for application and locations.
10. Coordinate purchase and installation of step-down transformers with electrical and/or controls contractor.

2.14 SOLENOID VALVES

- A. Water solenoid valve shall be two-way pilot operated, normally closed type, brass body construction for service indicated. Voltage shall be 24 VAC/60; valve size shall be 1" as called for on plans and UL listed. Valve shall be purchased and installed by plumbing contractor and wired under Division 26. Controller shall be located at teachers' demonstration table.
- B. Manufacturers: Automatic Switch Company (ASCO) 8210 series or equal by Tyco, ISIMET, or Simco Signaling Products.
- C. Gas solenoid valve shall be two-way pilot operated, normally closed type, brass body construction for service indicated. Voltage shall be 24 VAC/60; valve size shall be 1" as called for on plans and UL listed. Valve shall be purchased and installed by plumbing contractor and wired under Division 26. Controller shall be located at teachers' demonstration table.
- D. Manufacturers: Automatic Switch Company (ASCO) 8215 series or equal by Tyco, ISIMET, or Simco Signaling Products.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
 4. Install RPZ backflow preventer assemblies on wall accessible from floor no higher than 5'-0" AFF.
- C. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- D. Install water control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- E. Install balancing valves in locations where they can easily be adjusted.

- F. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 - 1. Install thermometers and water regulators if specified.
 - 2. Install cabinet-type units recessed in or surface mounted on wall as specified.
 - 3. Install on wall accessible from floor.
- G. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve, solenoid valve.
- H. Install water hammer arresters in water piping according to PDI-WH 201 and accessible above ceilings. Install access panels where required in hard ceilings.
- I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow. Valve shall be installed above accessible ceilings.
- J. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.
- K. Install tempering valves at kitchen hand wash sinks and adjust to 105 degrees F.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding."
- C. Connect wiring according to Division 26 Section "Conductors and Cables."

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 - 1. Reduced-pressure-principle backflow preventers.
 - 2. Dual-check-valve backflow preventers.
 - 3. Water pressure-reducing valves.
 - 4. Calibrated balancing valves.
 - 5. Primary, thermostatic, water mixing valves.
 - 6. Trap Primer Distribution Units.
 - 7. Domestic Water Heaters.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Mechanical Identification."

3.4 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.

- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.
- D. Set field-adjustable temperature limit stops on faucets and shower valves.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

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. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.

B. PERFORMANCE REQUIREMENTS

- C. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 20-foot head of water.

1.3 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and details.
- C. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, below floor for sanitary waste and vent, and kitchen waste and vent. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF.

- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.
- D. Manufacturers:
 - 1. Charlotte Pipe
 - 2. Tyler Pipe
 - 3. AB&I

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, above floor for sanitary waste and vent, and kitchen waste and vent. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF.
 - 1. Manufacturers:
 - a. Charlotte Pipe
 - b. Tyler Pipe
 - c. AB&I
- B. Shielded Couplings: ASTM 1540 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
 - a. Manufacturers:
 - 1) Clamp-All Corp. - Model 80
 - 2) Husky – SD-2000
 - 3) Tyler Pipe; Soil Pipe Div.

2.5 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
 - a. Manufacturers:
 - 1) Cambridge Lee
 - 2) Howell Metal
 - 3) Cerro Flow Products

2.6 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, below floor for sanitary waste and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Series PS 100 sewer and drain pipe.
 - a. Manufacturers:
 - 1) Charlotte Pipe & Foundry Co.
 - 2) Sanderson
 - 3) Lasco
 - 4) Tigre

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfilling for work included in Division 22 of the specifications.

3.2 EXCAVATION

- A. Excavations shall be performed in strict accordance with latest OSHA regulations. Sheeting, bracing, barricades and fencing shall be installed wherever necessary to avoid undue hazards to workmen or passersby.
- B. During excavation, material shall be piled at a distance from the banks of the excavation that will avoid overloading and will prevent slides and/or cave-ins. Water accumulating in excavations shall be removed by pumping. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled under sidewalks and curbs where pipe can be installed as specified and back-fill can be tamped. All trenches and pit excavations shall be shored and/or braced as required to prevent slides and/or cave-ins.
- C. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and the making of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded. Over-depths shall be backfilled as specified and with materials for backfilling as specified.

3.3 BACKFILLING

- A. The trenches shall not be backfilled until all required pressure and/or leak tests on piping are performed and until the mechanical systems as installed conform to requirements specified in the several sections covering the installation of the various systems. Trenches shall be backfilled to the ground surface with clean, selected excavated material or other material that meets compaction requirements and as hereinafter specified. Pavement and base course disturbed by trenching operation shall be restored to its original condition.
- B. Backfill material shall be deposited in 6-inch thick layers and compacted with mechanical tamps to the density of the adjacent soil or grade until there is a cover of not less than 2 feet over pipes. The backfill material in this portion of the trench shall consist of earth, sandy clay, soft shale, or other materials free from objects larger than 1 inch in any direction.
- C. The remainder of the trench shall be backfilled with clean, select material that is free of stones larger than 3 inches in any direction. Backfill material shall be deposited in layers not exceeding 6 inches thick, and each layer shall be compacted mechanically. Settling of granular, non-cohesive material with water will be permitted. The surface shall be mounded over for settling and left in a uniform condition.

3.4 COMPACTION AND TESTING

- A. Areas under building locations, paving, walks or other structures which may be placed on site at a future date shall be compacted to 95% minimum dry proctor.

3.5 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground, soil and waste and kitchen waste piping 10" and smaller shall be the following:
 - 1. Hubless cast-iron soil pipe and fittings heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
 - 2. Copper DWV tube, copper drainage fittings, and soldered joints.
- C. Aboveground, sanitary waste and kitchen vent piping 6" and smaller shall be the following:
 - 1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
- D. Underground, soil, waste, and vent piping 6" and smaller shall be one of the following:
 - 1. Schedule 40, solid wall, PVC piping, solvent socket weld DWV fittings.
- E. Underground, kitchen waste, and vent piping 6" and smaller shall be the following:
 - 1. Service weight, cast iron soil piping; hub and spigot, compression gaskets or lead and oakum joints.

3.6 PIPING INSTALLATION

- F. Sanitary sewer piping outside the building is specified in Division 33 Section "Site Sanitary Sewer Construction."
- G. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- H. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- I. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."
- J. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of

pipng upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

- M. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller or 2 percent where called for on plans; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 1 percent downward in direction of flow or 2 percent where called for on plans.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- N. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- P. Hub and spigot piping connections shall not be used above slab on grade.
- Q. Install PVC storm drainage piping according to ASTM D 2665.
- R. Install underground PVC storm drainage piping according to ASTM D 2321.

3.6 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- C. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
- D. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
- E. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- F. PVC Non pressure Piping Joints: Join piping according to ASTM D 2665.

3.7 VALVE INSTALLATION

- A. General valve installation requirements are specified in Division 22 Section "General-duty Valves for Plumbing Piping."
- B. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.8 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Install individual, straight, horizontal piping runs according to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer than 100 feet: MSS Type 43, adjustable roller hangers.
 - c. Longer than 100 feet, if indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6: 60 inches with 3/4-inch rod.
 - 5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 - 5. NPS 6: 10 feet with 5/8-inch rod.
 - 6. NPS 8: 10 feet with 3/4-inch rod.
- H. Install supports for vertical copper tubing every 10 feet.
- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.9 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.10 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Water test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.
- E. Video camera testing shall be performed on under floor sanitary waste systems, and kitchen waste system to the sanitary sewer manhole connection. Refer to section 227000 "Plumbing Systems Testing" requirements, procedures and reporting.

3.11 UNDERGROUND PIPING IDENTIFICATION

- A. All PVC underground sanitary waste and vent piping where allowed or identified on plans installed outside the building pad shall have continuous warning identification tape installed 12" above the top of the pipe and a minimum of 6" below finished grade.
- B. All exterior underground PVC piping shall have a continuous tracer wire installed on the top of the pipe and attached with cable ties on 6' centers maximum spacing and within 12" from tees, branch connections and manufactured elbows.

3.12 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221319 - DRAINAGE PIPING SPECIALTIES

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. This Section includes the following drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Roof Drains.
 - 4. Roof flashing assemblies.
 - 5. Through-penetration firestop assemblies.
 - 6. Downspout Nozzles.
 - 7. Miscellaneous drainage piping specialties.
 - 8. Solids interceptors.
 - 9. Residential Food Waste Disposers.
- B. Related Sections include the following:
 - 1. Division 22 Section "Plumbing Fixtures" for hair interceptors.

1.3 DEFINITIONS

- A. PE: Polyethylene plastic.
- B. PVC: Polyvinyl chloride plastic.

1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate size and location of roof penetrations.
- C. Coordinate locations of wall cleanouts so as not to be located behind casework or cabinets.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Cleanouts shall be provided where shown on the drawings, and as required by the applicable plumbing code. All wall and floor cleanouts shall have access cover and cleanout plugs removed at time of final project review.
- B. Cleanouts on under floor drainage piping shall have piping extended to the floor and finished with cleanout plug and removable floor plate.
- C. Cleanouts installed in carpeted areas shall have carpet marker and securing screw.
- D. Cleanouts in waterproofed floors or overhead slabs shall have flashing clamps.
- E. Cleanouts in vertical piping shall be roughed with centerline not more than 1'-6" above the finished floor, but high enough for escutcheon cover to clear the baseboard.
- F. For Walls: Cleanouts shall be no-hub cleanout tee with bronze countersunk plug tapped for machine screw with shallow stainless-steel face-of wall access cover.
 - 1. Jay R. Smith 4510-Y
 - 2. Josam 58790
 - 3. Wade 8560E
 - 4. Zurn Z-1446-BP
 - 5. Watts Drainage CO 460 RD
- G. For Concrete Floors: Cleanouts shall have cast iron body, adjustable round scoriated nickel bronze cover and rim, stainless steel Philips head securing screws, and countersunk taper threaded bronze plug.
 - 1. Jay R. Smith 4028C-U-PB
 - 2. Josam 56000-15-22
 - 3. Wade W-6010-75
 - 4. Zurn Z-1405-2
 - 5. Watts Drainage CO 200 R
- H. Yard Cleanouts: Cleanouts shall have tractor weight cast iron housing and countersunk bronze plug. Cleanouts shall be set in a 16" X 16" X 6" deep poured concrete pad set flush with grade.
 - 1. Jay R. Smith 4243-U
 - 2. Josam 56050-22
 - 3. Wade 7030-2
 - 4. Zurn Z1450-1
 - 5. Watts Drainage CO 200 RX-4-34B
- I. A cleanout plug and cleanout cover removal tool for each type cleanout plug and cleanout cover shall be installed on wall of main mechanical room at close-out of project for use by school personnel. Cleanout tools shall be turned over to the Architect and signed for prior to substantial completion.
- J. Immediately prior to Owner's final review, all wall and floor cleanout plugs shall be removed from cleanouts on the final project review to assure the Owner that cleanout plugs

can be removed without any obstructions. Apply anti-seize lubricant to all threads of cleanout plugs and replace cleanout plugs and access covers immediately following Owner's final review.

1. Acceptable manufacturers of anti-seize lubricants:
 - a. Fel-Pro C5-A
 - b. Rectorseal Break-out
 - c. Lub-O-Seal Never-seez

2.2 FLOOR DRAINS

A. FD-1:

1. Floor drains shall have a cast iron body and flashing flange with adjustable 6" round nickel bronze strainer, stainless steel Philips head securing screws, sediment bucket and trap primer connection.
2. Drains shall be: Jay R. Smith 2010-A-B-P050 or approved equal by Josam, Mifab, Zurn, Wade or Watts Drainage.

B. FD-2:

1. Floor drain shall have coated cast iron body and flashing flange, 7" round nickel bronze strainer with anti splash collar.
2. Drains shall be: Jay R. Smith 2010-A-F-37 or approved equal by Josam, Mifab, Zurn, Wade or Watts Drainage.

C. FD-3: (Mechanical Rooms):

1. Drain shall be coated cast iron body and cast-iron flashing clamp, 9" diameter adjustable cast iron grate with sediment bucket and 1/2" trap primer tapping.
2. Drains shall be: Jay R. Smith 2350-B-P050 or approved equal by Josam, Mifab, Zurn, Wade or Watts Drainage.

D. FS-1: (Floor Sink):

1. Drain shall be cast iron body, acid resistant coated with 8-1/2" square nickel bronze top, dome bottom strainer, minimum 6" deep with 3" outlet.
2. Drains shall be: Jay R. Smith 3100-13 or approved equal by Josam, Mifab, Zurn, Wade or Watts Drainage.
3. Provide top grate/cover options as called for on plans.

E. FFD: (Funnel Floor Drain):

1. Drain shall have a cast iron body and cast-iron flashing flange with adjustable 6" round nickel bronze strainer with funnel attached to grate top.
2. Drain shall be: Jay R. Smith 2010-A/Fig. 3580-NB or approved equal by Josam, Mifab, Zurn, Wade or Watts Drainage.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acorn Engineering Company; Elmdor/Stoneman Div.
 - b. Thaler Metal Industries, Ltd
 - c. Zilla Flashing Products, Inc.

- B. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch-thick, lead flashing collar and skirt extending at least 10 inches from pipe, with galvanized-steel boot reinforcement and counter flashing fitting.

2.4 ROOF DRAINS

A. Metal Primary Roof Drains (RD):

1. Basis-of-Design Product: Jay R. Smith 1015-C-R-CID or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Zurn Plumbing Products Group; Specification Drainage Operation
 - c. Watts Drainage
2. Standard: ASME A112-21.2M
3. Pattern: Roof drain.
4. Body Material: Cast iron
5. Dimensions of Body: Nominal 15" drain
6. Combination Flashing Ring and Gravel Stop: Required
7. Flow-Control Weirs: Not required
8. Outlet: Bottom
9. Dome Material: Cast iron
10. Extension Collars: Required
11. Underdeck Clamp: Required
12. Sump Receiver: Required

B. Metal Primary Roof Drains – Low Profile (RD-A):

1. Basis-of-Design Product: Jay R. Smith 1330-C-R-CIDG or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Zurn Plumbing Products Group; Specification Drainage Operation
 - c. Watts Drainage
2. Standard: ASME A112-21.2M
3. Pattern: Roof drain.
4. Body Material: Cast iron
5. Dimensions of Body: Nominal 8-1/2" drain
6. Combination Flashing Ring and Gravel Stop: Required
7. Flow-Control Weirs: Not required
8. Outlet: Bottom 4"
9. Dome Material: Cast iron
10. Extension Collars: Required
11. Underdeck Clamp: Required
12. Sump Receiver: Required

2.5 DOWNSPOUT NOZZLES

- A. Overflow roof drain piping shall terminate thru exterior wall high in a downspout nozzle sized as shown on plans. Locate in plan and elevation as indicated on Architectural plans. Nozzle shall be a cast bronze body with wall flange for mounting on exterior wall at minimum 3 places. Cast iron overflow drain piping shall be threaded to screw into nozzle.
- B. Manufacturers: Jay R. Smith 1770, Zurn Z-199, Josam 25010 or Wade 3940.

2.6 SOLIDS INTERCEPTORS

A. Solids Interceptors:

1. Manufacturers: Subject to compliance with requirements, provide Jay R. Smith model no. 8714T or an equal product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Schier Products Company.
2. Type: Factory-fabricated interceptor made for removing and retaining solids from wastewater.
3. Body Material: Cast iron.
4. Interior Separation Device: Perforated strainer basket.
5. Interior Lining: Corrosion-resistant enamel.
6. Exterior Coating: Corrosion-resistant enamel.
7. Inlet and Outlet Size: 1-1/2" or 2".
8. End Connections: Threaded.

2.8 RESIDENTIAL FOOD WASTE DISPOSER

A. Residential Food Waste Disposers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Insinkerator Badger 5
 - b. Kenmore
 - c. Whirlpool
2. Type: Factory-fabricated disposer made for continuous feed operation
3. Body Material: Galvanized steel construction.
4. Horsepower: 1/2 HP, 120 volts, 60 Hz, 1 phase
5. Outlet Size: 1-1/2".
6. Dishwasher drain Connection: 3/4".
7. Manual reset overload protection.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 3 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
 5. Cleanouts shall not be located behind casework or cabinets.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall. Install high enough for escutcheon cover to clear baseboard.
 - E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
 - F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
 - G. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 7.
 - 1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 - 2. Position roof drains for easy access and maintenance.
 - H. Install deep-seal traps on all mechanical room floor drains and other waste outlets, where indicated on plans, or as required by Code.
 - I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - J. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems. Install interceptors with sediment bucket removal accessible without modifications to casework.
 - K. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
 - L. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.
 - M. Install trap primer lines below slab on grade to pitch to drains. No joints shall be installed in trap primer lines below slab on grade. Trap primer lines below grade shall be wrapped and coated.
- 3.2 CONNECTIONS
- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 22 40 00 – PLUMBING FIXTURES

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. This Section includes the following conventional plumbing fixtures and related components. Refer to “Plumbing Fixture Schedule” found at the end of this section for basis of design and Owner preferred fixtures and model numbers.
 - 1. Lavatory Faucets
 - 2. Protective shielding guards
 - 3. Fixture Supports
 - 4. Wall Hung Lavatories
 - 5. Flushometers
 - 6. Toilet Seats
 - 7. Water Closets
 - 8. Countertop Sink Faucets
 - 9. Drop-in Stainless-Steel Sinks
- B. Related Sections include the following:
 - 1. Division 10 Section "Toilet and Bath Accessories."

1.3 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
- C. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Regulatory Requirements: Comply with requirements in the Georgia Accessibility Code for plumbing fixtures for people with disabilities.
- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
 - 2. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
 - 3. Stainless-Steel Residential Sinks: ASME A112.19.3.
 - 4. Vitreous-China Fixtures: ASME A112.19.2M.
- G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 - 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 - 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 - 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 - 4. Faucets: ASME A112.18.1.
 - 5. Hose-Connection Vacuum Breakers: ASSE 1011.
 - 6. Hose-Coupling Threads: ASME B1.20.7.
 - 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 - 8. NSF Potable-Water Materials: NSF 61.
 - 9. Pipe Threads: ASME B1.20.1.
 - 10. Supply Fittings: ASME A112.18.1.
 - 11. Brass Waste Fittings: ASME A112.18.2.
- H. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
 - 1. Atmospheric Vacuum Breakers: ASSE 1001.
 - 2. Brass and Copper Supplies: ASME A112.18.1.
 - 3. Plastic Tubular Fittings: ASTM F 409.
 - 4. Brass Waste Fittings: ASME A112.18.2.
- I. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Flexible Water Connectors: ASME A112.18.6.

2. Grab Bars: ASTM F 446.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Off-Floor Fixture Supports: ASME A112.6.1M.
5. Pipe Threads: ASME B1.20.1.
6. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 WARRANTY

- A. All fixtures and accessories shall be warranted against defects in materials and workmanship for a period of one year from date of acceptance by the Owner.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

- A. Lavatory Faucets: P301H
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Chicago Faucets
 - b. American Standard
 - c. Sloan
 - d. Delta 22C150 (basis of design)
 - e. T & S Brass
 - f. Zurn
 2. Description: Single-control mixing valve with brass stems and ½” threaded inlet shanks. Provide .5 gpm flow limiting aerators. Include hot and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

2.2 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers P301H, P610H:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGuire Manufacturing Co., Inc.
 - b. Plumberex Specialty Products Inc.
 - c. TRUEBRO, Inc.
 2. Description: Manufactured plastic wraps for covering plumbing fixture hot and/or cold- water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

2.3 FIXTURE SUPPORTS

- A. All wall hung water closets, lavatories, urinals, and drinking fountains shall be supported independently of the wall by a commercial floor mounted carrier consisting of rectangular steel uprights with welded feet and secured to floor with lead anchor inserts or self-drilling expansion shields and lag bolts at each location. Wall brackets and conceal arms shall be provided where

appropriate for fixture being supported. Leveling and locking hardware shall be provided for lavatory carrier concealed arm supports.

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Josam Company.
 2. MIFAB Manufacturing Inc.
 3. Jay R. Smith
 4. Zurn
 5. Wade

2.4 WALL HUNG LAVATORIES

- A. Lavatories, P301H:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard
 - b. Kohler Co.
 - c. Zurn
 - d. Sloan
 2. Description: Accessible, wall-mounting, 20"x18" white, cast iron fixture with three-hole drilling, with backsplash and drilled for concealed arm supports.
 3. Caulk fixture at wall.

2.5 FLUSHOMETERS

- A. Flushometers, P101H:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Sloan (Basis of Design)
 - b. Zurn
 - c. Moen
 - d. Toto
 2. Description: Manual flushometer for water-closet-type fixtures. Include brass body with corrosion-resistant internal components, vandal resistant cap, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, polished chrome-plated finish on exposed parts and solid ring pipe support to wall. Provide ADA handle on accessible fixtures. Water closets shall have a 1-1/2" .
 3. Provide solid ring supports on water closet flush valves.
 4. Basis of design – water closet flush valve; Sloan Royal 111-1.28
 5. Flush valves for water closets shall be 1.28 gpf.
 6. Coordinate installation of flushometer rough-in with grab bars in handicap stalls.

2.6 TOILET SEATS

- A. Toilet Seats, P101H:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bemis Manufacturing Company. 1955 SSCT
 - b. Church Seats. 295 SSCT

- c. Olsonite Corp. 10 SSCT
Description: Toilet seat for water-closet-type fixture.
Material: Molded, solid plastic.
- d. Configuration: Open front without cover.
- e. Size: Elongated.
- f. Hinge Type: SC, self-sustaining, check, with Sta-Tite commercial fastening system.
- g. Class: commercial.
- h. Color: White.

2.7 WATER CLOSETS

A. Water Closets, P101H:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Standard Companies, Inc.
 - b. Sloan
 - c. Kohler Co.
 - d. Zurn
2. Description: Accessible, floor-mounting, floor-outlet, white, elongated, 1.28 gpf vitreous-china fixture designed for flushometer valve operation, top spud with brass floor mounting hardware and bolt caps.
3. All water closet bowl gaskets between floor and waste pipe connection shall be a combination of wax seal with plastic or urethane reinforced flanged polyethylene sleeve permanently molded into gasket assembly.
 - a. Oatey Model No. 31194
 - b. Hercules Plumbing Products Johni-Ring Model No. 90-220
 - c. Plastic Oddities Inc. Model BG-7k.
4. Provide brass floor mounting bolt hardware.
5. Grout fixture base at floor.

2.8 COUNTERTOP SINK FAUCETS

A. Sink Faucets, P610H:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Chicago Faucets.
 - b. Elkay Manufacturing Co.
 - c. Just Manufacturing Company.
 - d. Delta 420LF (Basis of Design)
 - e. T & S Brass and Bronze Works, Inc.
 - f. Zurn Plumbing Products Group; Commercial Brass Operation.
2. Description: Deck mounted faucet, three or four-hole fixture, faucet with or without hand spray. Include hot and cold-water indicators where required; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

2.9 DROP-IN STAINLESS-STEEL SINKS

A. Sinks, P610H:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Elkay Manufacturing Co.
 - b. Just Manufacturing Company.
 - c. Moen, Inc.
 - d. Kohler
2. Description: One and Two compartment, drop-in, self rimming, 18 gauge, 300 series stainless steel sink. Drilling, depth and size as scheduled. See basis of design fixture schedule at the end of this section for specific sink requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- C. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- D. Install wall-mounting fixtures with tubular waste piping attached to supports.
- E. Install counter-mounting fixtures in and attached to casework.
- F. Install fixtures level and plumb according to roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture.
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system. Cleanout plug in trap shall be accessible for removal of plug.

- I. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves. Faucet assemblies shall be set square to sinks and lavatories, with paired faucet handles set symmetrical in the off position.
- J. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- K. Install deep escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing".
- L. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."
- M. Miscellaneous wall mounted items such as hose bibs, wash down fittings and flush valves shall have supplementary steel angles and a steel mounting plate securely attached to the wall framing to provide rigid support.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Operate and adjust controls. Replace damaged and malfunctioning units and controls.

- C. Adjust water pressure at faucets to produce proper flow and stream.
- D. Replace washers, cartridges and/or seals of leaking and dripping faucets and stops.
- E. Adjust faucet temperature limit stops to 105 F maximum.

3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
 - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 - 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 40 00 (EXCEPT FOR THE FOLLOWING PLUMBING FIXTURE SCHEDULE)

PLUMBING FIXTURE SCHEDULE

- P101H Water Closet - Floor Mounted – Handicap - Flush Valve – 1.28 GPF - Kohler “Highcliff Ultra” No. K-96057, white vitreous china toilet, elongated siphon jet action bowl, two bolt caps, Sloan Regal 111-YBYC flush valve with solid ring stanchion secured to wall, Church Model 295-SSCT white solid plastic open front heavy-duty seat. Coordinate water rough-in with grab bars. Flush valve shall be installed to open side of stall.
- P301H Lavatory - Wall Hung – Handicap – Hot and cold water - Kohler “Greenwich” No. K-2031 (20"x18") white, cast iron lavatory with concealed overflow, faucet, McGuire Model No. 155A grid drain assembly, McGuire No. 8872C-DF 1-1/4" chrome plated p-trap with brass nuts, cleanout plug, and deep wall escutcheon, McGuire No. H170LK supply with angle stops, loose tee keys, and deep wall escutcheons. Where water temperature exceeds 110°F, provide individual tempering valve.
- P608 Utility Sink – Freestanding - Single Compartment - Elkay Model No. WNSF8124, 14-gauge 300 series stainless steel sink with 1/4" radius cove corner compartments, punched with 2 faucet holes in backsplash on 8" centers, and 3-1/2" drain opening. Elkay LK-35 cup strainer, 1-1/2" chrome plated tailpiece and tubing to wall. Elkay Model No. LK940HA08T4H chrome plated back mount faucet with swing spout check stops and escutcheons, McGuire No. H170LK loose key chrome plated angle stops with supplies and deep wall escutcheons. Coordinate required roughing heights

with fixture purchased. Where water temperature exceeds 110°F, provide individual tempering valve.

- P610H Work Room Sink – Countertop - Double Compartment – Handicapped - Elkay Model No. LR-3319, 18 gauge type 304 stainless steel sink punched with 3 faucet holes on 4" centers, Elkay LK-35 cup strainers, 1-1/2" offset chrome plated tailpiece, and McGuire No. 8912C-DF - 1-1/2" chrome plated p-trap with brass nuts, cleanout plug and deep wall escutcheon, 8" center set sink faucet with hose and spray, swing spout and 1/2" inlet shank connections, McGuire No. LFH170LK loose key angle stops, chrome plated copper tube supplies and deep wall escutcheons. Install in countertops provided by others; coordinate required roughing heights with countertop heights as indicated. Provide handicapped covers on offset drain, p'trap and both supplies. Add dishwasher drain tailpiece where required for installation of undercounter dishwasher drains. Where water temperature exceeds 110°F, provide individual tempering valve.
- P802 Emergency Eyewash unit shall be a unit complete with stainless-steel eyewash bowl with twin ABS anti-surge eyewash heads with dust covers and stainless-steel tailpiece and p-trap. Eyewash unit shall be activated by push paddle with stay open valve. Provide tempering valve from unit manufacturer. Basis of design shall be Bradley S19224B.

SECTION 224700 - DRINKING FOUNTAINS & WATER COOLERS

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. This Section includes the following related components:
 - 1. Water Coolers.
 - 2. Bottle Filling Stations.
 - 3. Fixture supports.

1.3 DEFINITIONS

- A. Accessible Drinking Fountain: Fixture that can be approached and used by people with disabilities.
- B. Drinking Fountain: Fixture with nozzle for delivering stream of water for drinking.
- C. Fitting: Device that controls flow of water into or out of fixture.
- D. Fixture: Drinking fountain or water cooler unless one is specifically indicated.

1.4 SUBMITTALS

- A. Product Data: For each fixture indicated. Include rated capacities, furnished specialties, and accessories.
- B. Operation and Maintenance Data: For fixtures to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" Public Law 101-336, "Americans with Disabilities Act"; for fixtures for people with disabilities.
- B. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- C. ARI Standard: Comply with ARI's "Directory of Certified Drinking Water Coolers" for style classifications.

1.6 WARRANTY

- A. The complete water cooler and packaged water chiller unit inclusive of compressor, hermetically sealed refrigeration unit, water system, water regulator and electrical components shall be warranted be free from defects in material and workmanship for (1) year from the date of installation. Contractor shall submit the warranty data sheet to the

Architect within 3 days of completed installation for record. For the second thru fifth years, the manufacturer shall warrant the compressor and the hermetically sealed refrigeration system, inclusive of the tank assembly when the part of the hermetically sealed refrigeration unit for an additional four years from the end of the initial one-year warranty period.

PART 2 - PRODUCTS

2.1 BOTTLE FILLING STATIONS

- A. Hi/Lo Bottle Filling Stations, P402BH:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Elkay Model No. LZSTL8WSLK or a comparable vandal resistant product by one of the following:
 - a. Oasis Manufacturing Co.
 - b. Halsey Taylor.
 2. Description: Accessible, Style W, wall-mounting water cooler.
 - a. Material: Stainless steel top, stainless steel cabinet finish.
 - b. Receptor Shape: Rectangular.
 - c. Bubblers: One per unit, vandal resistant, with adjustable stream regulator, located on deck.
 - d. Control: Push button.
 - e. Bottle filler: Electronic sensor, no touch activation, automatic 20 second shutoff timer.
 - f. Filter: Non-filtered
 - g. Supply: NPS 3/8, stop valve with isolation ball valve above ceiling.
 - h. Drain: Grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.2.
 - i. Support: Type I, water cooler carrier. Refer to "Fixture Supports" Article.
 - j. Caulk fixture top at wall.
 - k. Install toggle bolts thru wall at bottom of unit.

2.2 FIXTURE SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Josam Co.
 2. MIFAB Manufacturing, Inc.
 3. Smith, Jay R. Mfg. Co.
 4. Zurn Plumbing Products Group; Specification Drainage Operation.
 5. Watts Drainage.
- C. Description: ASME A112.6.1M, water cooler carriers. Include vertical, steel uprights with feet and tie rods and bearing plates with mounting studs matching fixture to be supported.
1. Supports for Accessible Fixtures: Include rectangular, vertical, steel uprights instead of steel pipe uprights.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.
- B. Examine walls and floors for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Use floor mounted carrier supports for wall-mounting fixtures, unless otherwise indicated.
- B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.
- C. Provide push back glass filler option where called for on plans.

3.3 INSTALLATION

- A. Install fixtures level and plumb. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- B. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Division 22 Section "General-duty Valves for Plumbing Piping."
- C. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- D. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."
- E. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."
- F. Fixtures shall be supported at bottom with toggle bolts thru wall.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures. See plans for where new drinking fountains are to replace existing units. Coordinate with existing conditions. Modify waste rough is as required for new fixture setting height.

3.5 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.

3.6 CLEANING

- A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

END OF SECTION 224700 (EXCEPT FOR THE ATTACHED PLUMBING FIXTURE SCHEDULE)

PLUMBING FIXTURE SCHEDULE

P402BH Electric Water Cooler - Wall Hung - Handicapped – Hi/Lo Bottle Filling Station - Elkay LZSTL8WSLK vandal resistant unit with a minimum capacity of 8.0 gph of 50-degree water at A.R.I. standard conditions, bottle filling station, with wall hanger, vandal resistant push button control, 1-1/4" tailpiece, McGuire No. 2158LK angle stop and supply with deep escutcheon, McGuire No. 8872C-DF 1-1/4" 17-gauge chrome plated p-trap with brass nuts, cleanout plug, and deep wall escutcheon. Provide floor mounted concealed carrier and mount ADA fixture with center of bubbler at 36" above finished floor.

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

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. See Editing Instruction No. 3 in the Evaluations for discussion about how this Section supplements other Division 23 Sections.
- B. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. HVAC demolition.
 - 3. Equipment installation requirements common to equipment sections.
 - 4. Painting and finishing.
 - 5. Concrete bases.
 - 6. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. PVC: Polyvinyl chloride plastic.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces.
- D. Coordinate locations of floor drains and floor cleanouts with HVAC Equipment pads and units in all mechanical equipment rooms, closets and platform areas. Coordination layout drawings shall be prepared and coordinated by all trades.
- E. No mechanical, plumbing or fire protection equipment, ductwork or piping shall be located overhead within 42" of electrical switchboards or panelboards.
- F. No water piping (HVAC, domestic, storm, sanitary, or sprinkler) shall be located above electrical switchboards or panelboards. If the governing authority requires fire sprinklers in the electrical rooms, spray shields shall be fabricated and installed to protect the live panels or switchboards from spray from sprinkler discharge.
- G. Coordinate sanitary waste and vent stub ups and rainwater/downspout stub ups at slab on grade installations with structural plans to ensure that footings and/or grade beams are dropped or stepped to avoid piping penetrations thru footings and grade beams.
- H. The contractor shall work with the commissioning agent/ company to meet the requirements of 23 80 00 Mechanical Commissioning Requirements.

1.7 CODES AND REGULATIONS

- A. All materials and workmanship shall comply with the latest editions of the following codes and standards, as applicable:
- Manufacturer's Standardization Society (MSS) Standard Practice (SP) 58: Pipe Hangers and Supports - Materials, Design and Manufacture
 - MSS SP-69: Pipe Hangers and Supports - Selection and Application
 - MSS SP-69: Pipe Hangers and Supports - Fabrication and Installation Practices
 - National Fire Protection Association (NFPA) Pamphlet 13: Installation of Automatic Sprinkler Systems
 - NFPA 13: Installation of Sprinkler Systems
 - NFPA 24: Installation of Private Fire Service Mains and Their Appurtenances
 - NFPA 30: Flammable and Combustible Liquids Code
 - NFPA 90A: Installation of Air Conditioning and Ventilating Systems
 - NFPA 90B: Installation of Warm Air Heating and Air Conditioning Systems
 - NFPA 96: Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment
 - NFPA 101: Safety to Life from Fire in Buildings and Structures
 - NFPA 211: Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances
 - NFPA 231: General Storage
 - National Electrical Code, 2017 Edition
 - International Mechanical Code, 2018 Edition, with Georgia Amendments
 - International Energy Conservation Code, 2015 Edition, with Georgia Amendments
 - International Building Code, 2018 Edition, with Georgia Amendments
 - International Plumbing Code, 2018 Edition, with Georgia Amendments
 - International Fuel Gas Code, 2018 Edition, with Georgia Amendments
 - International Fire Code, 2018 Edition, with Georgia Amendments
 - All local prevailing County codes and Ordinances
- B. All workmanship and materials shall comply with all ordinances and regulations of all local authorities having jurisdiction.
- C. Contractor shall obtain all permits and licenses, and pay all fees, as required for execution of the contract. Arrange for necessary inspections required by City, County, State and other authorities having jurisdiction, and deliver certificates of approval to the Owner. In compliance

with the Georgia State Boiler Code, it is the responsibility of the Contractor (at his expense) to have each boiler and/or applicable pressure vessel inspected by a State of Georgia certified inspector upon installation of this equipment.

- D. This inspection report shall be submitted to the Georgia Department of Labor, Safety Engineering Section, 501 Pullman Street, Room 210, Atlanta, Georgia 30312, Attention Chief Safety Engineer.
- E. Upon the Georgia Department of Labor review of the inspection report and their inspection, they will place a tag indicating the State Serial Number on the inspected piece of equipment and issue a certificate of boiler or pressure vessel inspection. The original certificate issued is to be posted in the main Mechanical Room, with a copy sent to Owner and one copy is to be included in the closeout documents.

1.8 RECORD DRAWINGS

- A. As the work progresses, the Contractor shall maintain records and record all changes made daily on a set of contract mechanical drawings (HVAC, Plumbing & Fire Protection) during the progress of the work. The in-progress set of marked-up drawings, clearly showing the nature and extent of all changes, shall be maintained in the construction office at the site and clearly marked "Record Drawings". The "Record Drawings" shall be up to date and available for use at the time of any job site visit by the Engineer or Architect. The completed "Record Drawings" shall be presented to the Architect upon completion and acceptance of the work. Final payment and "close-out" of the project shall be dependent upon receipt and acknowledgment of the completed "Record Drawings".
- B. The Engineer shall furnish to the Contractor electronic files of the Contract Drawings in AutoCAD format for the Contractors' use in preparing a final electronic copy of the record drawings which shall incorporate all of changes made including all project addenda. Drawing changes shall be identified as follows:
 - 1. The affected change shall be identified in an enclosed clouded area of a consistent color not used to indicate the noted change.
 - 2. Each cloud shall have an identifier adjacent to the cloud identifying the date and origin of the change. (i.e., 1-12-06, Construction Directive, 1-12-06, Change Proposal, 1-12-06, Field Coordination, etc.).
- C. Submission of electronic Record Drawings shall be made on compact disk in AutoCAD format and accompany one (1) full size set of bond plots in color on white background. Plots shall be generated from the CD of electronic files. Electronic file names and plot sheet numbering shall match Contract Document format.

1.9 ACCESS DOORS & PANELS

- A. Furnish an access door and panels for each pipe and duct chase for each floor, fire dampers, etc. Size as required for access, 16" X 16" minimum.
- B. Also, provide access doors in all non-removable ceilings and in partitions and walls where necessary to maintain access to fire dampers, manual dampers, valves, shock arrestors, and other mechanical devices requiring access.
- C. Any access door installed in fire rated surface or assembly shall carry a U.L. Listing and an approved fire rating for that construction type.

- D. Provide access doors/panels as required to test and reset automatic fire dampers.
- E. Provide all access doors to the General Contractor for the timely inclusion in the building construction.
- F. Refer to architectural section "08311 – ACCESS DOORS AND FRAMES" for product's construction and installation requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.2 PAINTING

- A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.3 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."
- 8.

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.
- D. Provide factory start up on all major pieces of equipment, with letter of certification stating proper installation is present for the following components:

- Boilers
- Cooling tower & Heat exchanger
- Water Source Heat Pump Units
- Roof mounted A/C units
- Condensing units
- Air-handling Units
- Fan-Coil Units
- Range Hood
- Kitchen Hood
- Controls System
- Energy Management System
- Energy Recovery Units
- Pumps
- Fans

3.5 SHOP DRAWINGS

- A. Submit shop drawings along with an electronic formatted submittal for approval prior to commencing work. Hard copy shop drawings shall be bound in a three ring binder and shall include an index page with each item listed and referenced to sections with tabs. Tabs shall be cross referenced to index page. All shop drawings shall be prepared and submitted as a single package. **NO SHOP DRAWINGS WILL BE CHECKED UNTIL ALL HAVE BEEN SUBMITTED.** (HVAC controls submittals and any items with exceptionally long lead times that may affect the project completion date, as determined by the Engineer may be submitted separately). **Electronic shop drawings shall be a single PDF file and formatted as required for hard copy submittals. Each section shall be a bookmarked (tabbed) link named to describe the section. (ELECTRONIC SHOP DRAWINGS NOT PROPERLY FORMATTED WILL BE RETURNED UNCHECKED.)**
- B. The following format shall be followed:
 1. The submittal cover sheet shall include-
 - Project Name

Type of Shop Drawing including trade (HVAC, Plumbing, Fire Protection)
Mechanical Contractor's Company Name
Date of Submittal

2. The first sheet inside the submittal shall include all items on the cover sheet plus the following:
Owner
Architect
Engineer
Mechanical Contractor's Project Manager's Name
3. The supervising license holder(s) shall be identified, and a copy of their current valid license shall be included.
4. The second sheet shall include the following typed statement, signed and dated by the mechanical contractor's project manager-

"The enclosed submittal (shop drawings) has been reviewed for accuracy of equipment and system quality and component quantities. The available voltages have been coordinated with the electrical contractor. All coordination items with other trades have been completed including structural, electrical, and other mechanical division disciplines prior to ordering any equipment."

- C. The Contractor shall review the information prepared by his suppliers and note any changes required prior to submitting the information to the Engineer and shall include the form (found at the end of this section), Exhibit 1, entitled "Certification of Compliance - Shop Drawings" with each submittal prior to the index page and submittal data sheets. Failure to complete and execute this form will result in rejection of the submittal without review.
- D. Each individual submittal item shall be marked to show Specifications Section and Paragraph number which pertains to the item. Shop Drawings shall clearly indicate location, fixture no. or equipment designation, etc., so that the intended use of the equipment can be readily identified. Failure to make submittals accordingly shall be considered cause for rejection of shop drawings.
- E. Submittals shall be supported by descriptive material, such as catalog cuts, diagrams, certified performance curves and charts published by the manufacturer to show conformance to specification and drawing requirements, model numbers alone will not be acceptable. All literature shall clearly indicate the specified model number, options to be included, dimensions, arrangement, rating and characteristics of the proposed equipment. Capacities and ratings shall be based on conditions indicated or specified herein. Any deviations from specified equipment shall be clearly noted in red.
- F. The Engineer will review the shop drawings for errors in the Contractor's interpretation of the design intent only. Corrections or comments made on shop drawings during review shall not relieve the Contractor from compliance with requirements of the contract documents, plans and specifications. Review of shop drawings shall not relieve the Contractor from the responsibility for conforming and correlating all quantities and dimensions, coordinating his work with that of other trades, and performing his work in a safe and satisfactory manner.
- G. Review of shop drawings shall not permit any deviations from the plans and specifications nor shall it permit changes to the plans and specifications by the Engineer. Changes to or deviations from the contract documents are subject to the provisions of the General Conditions of the contract. Any required changes will then be issued by the Architect and executed by both the Owner and Contractor.
- H. Each individual submittal item shall be marked to show Specifications Section and paragraph number which pertains to the item. Shop Drawings shall clearly indicate location, fixture no. or

equipment designation, etc., so that the intended use of the equipment can be readily identified. Shop drawings shall be submitted for each of the following items:

Fans	Fire & Smoke Dampers
Air Distribution Devices	Automatic Dampers
Roof Mounted Air Intake/Relief Hoods	Flexible Ductwork
Electric Heaters	
Ductwork & Ductwork Construction	
Duct Access Panels	Vibration Isolation Equipment
Gas Flues	Roof Mounted A/C Units
Air-handling Units	Condensing Units
Manual Dampers	Roof Curbs
Pumps	Automatic Flow Control Valves
Boilers	Heat Exchangers
Chillers	Centrifugal Sediment Separator
Thermometers	Pressure Gauges
Relief Valve	Kiln Hood
Hot Water Unit Heaters	Pipe Identification Systems
Backflow Preventers	Manholes and Accessories
Plumbing Fixtures & Fittings	Water Heaters & Accessories
Valves & Unions	Cleanouts & Accessories
Shock Arrestors	Access Covers & Panels
Valve Schedules and Diagrams	Wall Hydrants & NFWH's
Floor Drains	Gauges
Sheet Lead Flashing	Energy Recovery Units
Pressure Reducing Valves	HVAC Pipe Accessories
Pipe Accessories	Bi-Polar Ionization Units
Pipe Hangers, Supports & Accessories	Contractor Start up forms
Flexible Pipe Hose Kits w/ Valves & Fittings	Fan-coil Units
Kitchen Rangehood & Associated Fire Suppression System	
Controls & Control Diagrams including Wiring Plans	
Pipe & Duct Insulation & Accessories	
Fire Protection: AHJ Approved Shop Drawings with Complete Hydraulic Analysis	
Fire protection system valves and accessories	
Supervisory switches & Flow switches	
Precast concrete drainage structures and vaults	
All equipment and systems training forms with a sign off blank	
Underground piping systems	

- I. For miscellaneous items not listed here, contractor shall submit shop drawings for approval, unless the item is to be provided and installed **exactly** as specified, without variance.
- J. Contractor shall provide a sign in sheet for each piece of equipment requiring Owner training noted in division 23. Training required for all equipment including the following: Water heaters, tempering valves, circulating pumps, HVAC pumps, electric heaters, boilers, cooling towers, water source heat pump units, condensing units, heat pump units, air handling unit, fan-coil units, rooftop units, split systems, energy recovery units, commercial kitchen hood, residential and commercial hood fire suppression systems and HVAC controls (controls shall include Reliable as well as any non-Reliable controls, i.e. wall mounted timers and wall mounted switches).
- K. Submit evidence of welders' qualifications prior to performing any welds.
- L. **In addition, contractor shall prepare and submit dimensioned shop drawings (drawn at minimum 1/4"=1'-0" scale) of all ductwork, piping and equipment (HVAC) on the entire**

project. The drawings shall be created with computer aided drafting software. This shall also include actual mechanical room layouts, typical sections through corridors, pipe sleeves and other penetrations through slabs and walls for HVAC including fire and smoke walls. These shop drawings shall be submitted as PDF, along with a set of prints equal to the number of copies of submittals required by the Contract Documents.

M. COMMISSIONING

1. The contractor will perform commissioning duties required to check that all devices work properly, as outlined in the contract documents, and as required by the equipment manufacturer's recommendations.
- 2.
3. The contractor shall or sub-contractor and shall provide the following:
 - a. Provide shop drawings of all equipment furnished.
 - b. Start all equipment and provide all labor required to keep it in good working order during the test and balance procedure. Provide clean filters in each unit at the start of the procedure.
 - c. Make all adjustments and corrections necessary to the equipment, air and water control devices, necessary to achieve the required HVAC system functions.
 - d. Refer to 23 08 00 for additional commissioning requirements.

END OF SECTION 23 05 00 (Except for 2 forms below:)

SECTION 23 05 00 - Exhibit No. 1

CERTIFICATION OF COMPLIANCE - SHOP DRAWINGS

To:

Project:

I have reviewed the contract documents, including but not limited to specifications, drawings, addenda, and change orders. To the best of my knowledge the materials described by the enclosed shop drawings are consistent with and meet the requirements of the aforementioned documents. I further recognize that; 1) the engineers review is to assist me in complying with the documents by checking for errors in my interpretation of the requirements set forth in the contract documents, 2) review of shop drawings, by the engineer, shall not relieve me of my responsibility for confirming and correlating all quantities, dimensions and work with that of other trades, and for performing the work in a safe and satisfactory manner, and 3) review of shop drawings, by the engineer, shall not permit any deviations from plans and specifications.

I understand that I will be required to remove and replace at no additional cost to the owner any item found to be inconsistent with or not meet the requirements of the contract documents.

The undersigned states that the above is true to the best of his knowledge and that he has the authority to legally bind his firm to the above terms. Failure to provide a legally binding signature shall void submittal.

Sub Contractor:

By: _____ Date: _____

Ga. State License No (Required): _____

Title: _____

Company: _____

General Contractor:

By: _____ Date: _____

Title: _____

Company: _____

SECTION 2 05 00 - Exhibit No. 2

A/C Contractor shall make out start-up cards for all heat and cool units as per start up card furnished below and shall furnish same before substantial completion inspection for each phase of construction.

A/C CONTRACTOR'S START-UP CARD

School Name _____

HVAC Contractor _____

Unit # _____

Unit Model Number _____ Unit Serial Number _____

A/C EQUIPMENT

Rated Volts - _____
Rated Amps - _____

COOLING

HEATING

Discharge Pressure	_____	_____
Suction Pressure	_____	_____
Return Air Temp.	_____	_____
Supply Air Temp.	_____	_____

GAS FIRED EQUIPMENT

(Boilers, etc.)

Unit # _____ Actual Manifold Pressure: _____ Mfg. Rated Manifold Pressure: _____

Actual Stack Pressure: _____ Rated Stack Pressure: _____

ELECTRIC HEAT

Unit # _____ Actual Volts _____ Rated Volts _____ Rated Amps _____ Actual Amps _____

SECTION 230513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 1. Motor controllers.
 2. Torque, speed, and horsepower requirements of the load.
 3. Ratings and characteristics of supply circuit and required control sequence.
 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.
- L. Manufacturers
 - 1. Baldor
 - 2. Marathon
 - 3. U.S.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: All motors used with VFD drives shall be suitable for inverter duty usage and comply with the following:
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
 - 5. Provide pre-installed Aegis SGR bearing protection rings (grounding rings) or equal on motor shaft for all motors with variable frequency drives. Ring shall be sized to protect motor bearings. Rings shall be maintenance free, conductive micro fiber, shaft grounding

ring with a minimum of two rows of circumferential micro fibers to discharge damaging shaft voltages away from the bearings to ground.

- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.
- D. Manufacturers
 - 1. Baldor
 - 2. Marathon
 - 3. U.S.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.6 STARTERS

- A. Power controllers shall be provided for the equipment furnished under this specification. When not provided as a component of the equipment specified, external starters shall be provided under this division to control the equipment as outlined in the control specifications. Starters and contactors shall be constructed in accordance with the NEMA Standards. Starters shall have overload and running protection in each power phase.
- B. Voltage for holding coils shall not exceed 120 volts, unless otherwise specified: provide built-in transformers with fuses. Provide auxiliary contacts as required by control circuits.
- C. Starters shall be furnished with individual phase thermal overload protection, and with two (2) normally open auxiliary contacts, "Hand-Off-Auto" switch, 24 VAC coil, 24 VAC control transformer, and pilot light.
- D. All external starters shall have NEMA-4 rated enclosures for weatherproof operation and stainless steel enclosure finish.
- E. Motor starters shall be manufactured by ABB A-line, Furnas, Square D, Westinghouse, Siemens, and General Electric.

- F. Each starter shall be provided engraved laminated plastic nameplates describing the piece of equipment being served.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 23 05 13

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

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. Metal pipe hangers and supports.
 2. Trapeze pipe hangers.
 3. Metal framing systems.
 4. Thermal-hanger shield inserts.
 5. Fastener systems.
 6. Pipe stands.
 7. Equipment supports.
- B. Related Sections:
 1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 2. Section 230548.13 "Vibration Controls for HVAC" for vibration isolation devices.
 3. Section 233113 Metal Ducts duct hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Metal framing systems.
 - 3. Pipe stands.
 - 4. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of trapeze hangers.
 - 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.
- C. In addition to the above maximum spacing requirements, hangers and supports shall be installed within 18" of each change in direction, regardless of pipe size or material.
- D. Provide all hangers and rods, turnbuckles, angles, channels and other structural supports to support the piping systems. Rods for pipe hangers shall be the following minimum sizes:

E.

<u>HANGER ROD DIAMETER</u>	<u>PIPE SIZE</u>
3/8"	2" and smaller
1/2"	2-1/2" and 3"
5/8"	4" and 5"
3/4"	6"

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

- A. MFMA Manufacturer Metal Framing Systems:
1. B-Line, by Eaton, Thomas & Betts, Unistrut
 2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
 3. Standard: MFMA-4.
 4. Channels: Continuous slotted steel channel with inturned lips.
 5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
 6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
 7. Metallic Coating: Electroplated zinc or Hot-dipped galvanized.
 8. Paint Coating: Epoxy
 9. Plastic Coating: Epoxy
- B. Non-MFMA Manufacturer Metal Framing Systems:
1. B-Line, by Eaton, Thomas & Betts, Unistrut
 2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
 3. Standard: Comply with MFMA-4.
 4. Channels: Continuous slotted steel channel with inturned lips.
 5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
 6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
 7. Coating: Zinc

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Pipe Shields, Inc., PHS Industries, Piping Technology and Products.
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, **zinc-coated** steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
 - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 2. Base: Plastic.
 - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand:
 - 1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 - 2. Bases: One or more; plastic.
 - 3. Vertical Members: Two or more protective-coated-steel channels.
 - 4. Horizontal Member: Protective-coated-steel channel.
 - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi , 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Stand Installation:
 - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 "Roof Accessories" for curbs.
- G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2" and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- N. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 :12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 2".

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

- E. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for refrigerant piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 12.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 12, requiring clamp flexibility and up to 4 inches of insulation.
 - 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 6. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 7. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 - 8. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F typical piping installations.
 - 3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 - 4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 - 2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 4. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 - 5. C-Clamps (MSS Type 23): For structural shapes.
 - 6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 9. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 10. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- P. Use mechanical expansion anchors instead of building attachments where required in concrete construction.

3.7 HANGER AND SUPPORT INSTALLATION

A. SUSPENDED HORIZONTAL PIPING

1. Support Spacing:

<u>NOMINAL PIPE SIZE</u>	<u>MATERIAL</u>	<u>MAXIMUM SPACING OF SUPPORTS / FT.</u>
Up through 1-1/2"	Steel & Copper	6'-0"
2" through 8"	Steel & Copper	8'-0"
2. In addition to the above maximum spacing requirements, hangers and supports shall be installed within 18" of each change in direction, regardless of pipe size or material.
3. Provide all hangers and rods, turnbuckles, angles, channels and other structural supports to support the piping systems. Rods for pipe hangers shall be as follows:

<u>HANGER ROD DIAMETER</u>	<u>PIPE SIZE</u>
3/8"	2" and smaller
1/2"	2-1/2" and 3"
5/8"	4" and 5"
3/4"	6"
4. Intermediate pipe supports provided between building structural members so as not to exceed maximum support spacing specified from top chord of framing joist shall be structural steel angles (minimum 2-1/2" X 2-1/2" X 1/4").
5. All ferrous metal pipe hangers and supplemental steel shall be provided with factory applied coat of rust inhibitive paint, plating or galvanizing.
6. Pipe hangers for suspending the following horizontal insulated piping shall be sized to fit around the pipe, pipe insulation and pipe insulation protective shields.

- a. Condensate piping
- b. Refrigerant piping
7. All supporting equipment shall be designed with a minimum factor of safety of five based on the ultimate tensile strength of the materials employed.
- B. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- C. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- E. Fastener System Installation:
 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- M. Insulated Piping: Comply with the following:
 1. Attach clamps and spacers to piping.
 - (a) Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - (b) Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

- (c) Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
- 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
- 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
- 4. Shield Dimensions for Pipe:
 - a. Provide galvanized sheet metal pipe insulation protection shields at each pipe hanger for all horizontal insulated water pipes and condensate drain pipes. Shield sizes shall be:
 - 1) Pipes 2" and smaller: 18 gauge X 12" long
 - 2) Pipes 2-1/2" and larger: 16 gauge X 18" long
 - b. Shields shall be 180 degree type at all pipe hangers, except that on trapeze hangers, pipe rack and on floor supported horizontal pipe shields shall be 360 degree type. For pipe sizes 2-1/2" and larger, use Foamglass inserts at all shields, hangers, sleeves, etc.
- 5. Pipes NPS 2-1/2" and Larger: Include wood or foamglass inserts.
- 6. Insert Material: Length at least as long as protective shield.

END OF SECTION 23 05 29

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

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. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Duct labels.
 - 5. Stencils.
 - 6. Valve tags.
 - 7. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Manufacturers: Bradmark, Seton, Brady, Mifab or approved equal are acceptable.
 - 2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 - 3. Letter Color: Black

4. Background Color: [White
 5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 6. Minimum Label Size: Length and width vary for required label content, but not less than 4 by 2 inch.
 7. Minimum Letter Size: 1.5" for unit number and 1" for room served for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 8. Fasteners: Stainless-steel self-tapping screws.
 9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, room name and number the unit serves.

2.2 WARNING SIGNS AND LABELS

- A. Seton, Stranco, Inc, Craftmark Markers
- B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- C. Letter Color: Black
- D. Background Color: Yellow.
- E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- F. Minimum Label Size: Length and width vary for required label content, but not less than 4 by 2 inch.
- G. Minimum Letter Size: 1 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- H. Fasteners: Stainless-steel self-tapping screws.
- I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

- A. Seton, Brimar, Craftmark Markers
- B. Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.
- C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping at least 1 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances].

2.4 VALVE TAGS

- A. Seton, Brimar, Craftmark Markers
- B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass wire-link chain
- C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

- A. Seton, Stranco, Inc, Craftmark Markers
- B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
 1. Size: 3 by 5-1/4 inches minimum
 2. Fasteners: Brass grommet and wire
 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 4. Color: Safety-yellow background with black lettering.

2.6 STENCILS

- A. Stencils for Ducts:
 1. Craftsmark, Carlton, Brimar.
 2. Lettering Size: Minimum letter height of 2 inches (32 mm) for viewing distances up to 15 feet (4-1/2 m) and proportionately larger lettering for greater viewing distances.
 3. Stencil Material: Fiberboard or metal.
 4. Stencil Paint: Exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.
 5. Identification Paint: Exterior, acrylic enamel. Paint may be in pressurized spray-can form.
- B. Stencils for Access Panels and Door Labels, Equipment Labels, and Similar Operational Instructions:
 1. Craftsmark, Carlton, Brimar.

2. Lettering Size: Minimum letter height of 2" for viewing distances up to 72 inches (1830 mm) and proportionately larger lettering for greater viewing distances.
3. Stencil Material: Fiberboard or metal.
4. Stencil Paint: Exterior, gloss, acrylic enamel. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, acrylic enamel. Paint may be in pressurized spray-can form.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.4 PIPE PAINTING AND LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Division 09 and as noted below.
 1. All building loop pipe (Condenser-Water Piping) shall be painted with a 12" band on each side of a wall penetration, each side of a floor penetration and as the pipe enters and exits chases.
 2. Colors:
 - a. Supply Piping: Safety-Green
 - b. Return Piping: Safety-Orange
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 30' along each run. Reduce intervals to 20 feet in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- D. Pipe Label Color Schedule:
1. Chilled-Water Piping: White letters on a safety-green background.
 2. Condenser-Water Piping: White letters on a safety-green background
 3. Heating Water Piping: White letters on a safety-green background
 4. Refrigerant Piping: Black letters on a safety-orange background

3.5 DUCT STENCIL INSTALLATION

- A. Install duct stencils on air ducts in the following color codes:
1. Blue: For cold-air supply ducts.
 2. Yellow. For hot-air supply ducts.
 3. Green. For exhaust-, outside-, relief-, return-, and mixed-air ducts.
- B. Stenciled Duct Labels: Stenciled labels shall show service and flow direction.
- C. Locate stencils and connections to equipment and near points where ducts enter into and exit from concealed spaces, and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
1. Valve-Tag Size and Shape:
 - a. 2" round for all water, gas, and refrigerant valves.
 2. Valve-Tag Colors:
 - a. Toxic and Corrosive Fluids: Black letters on a safety-orange background.
 - b. Flammable Fluids: Black letters on a safety-yellow background.
 - c. Combustible Fluids: White letters on a safety-brown background.
 - d. Potable and Other Water: White letters on a safety-green background.
 - e. Compressed Air: White letters on a safety-blue background.

- f. Defined by User: White letters on a safety-purple background, black letters on a safety-white background, white letters on a safety-gray background, and white letters on a safety-black background

3.7 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 23 05 53

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. The contractor shall obtain the services of an independent test and balance agency that specializes in and whose business is limited to the testing and balancing of air-conditioning systems.
- B. The contractor shall cooperate with the test and balance agency and shall provide the following:
 - 1. Notify the Architect when the system is completely installed and ready for testing and balancing.
 - 2. Provide shop drawings of all equipment furnished.
 - 3. Start all equipment and provide all labor required to keep it in good working order during the test and balance procedure. Provide clean filters in each unit at the start of the procedure.
 - 4. Make all adjustments necessary to the equipment including changing belts and pulleys or motor speed taps on fan systems so that the equipment can be balanced to deliver the air quantities specified on the drawings.
 - 5. Make all adjustments necessary to the piping system including cleaning strainers, plate and frame heat exchanger, and adjustment of balancing valve settings required to deliver the water flow quantities specified on the drawings.
 - 6. Coordinate the installation of clean filters in each unit with the Owner's filter vendor at the start of the Test and Balance procedure.
 - 7. Contractor shall verify all items listed on the "Test and Balancing (TAB) Readiness Checklist" are complete and the form is signed. Test and Balancing (TAB) Readiness Checklist" is located at the end of this section.
- C. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - 2. Balancing Hydronic Piping Systems:
 - a. Constant-flow hydronic systems.
 - b. Variable-flow hydronic systems.
 - c. Primary-secondary hydronic systems.
 - 3. Testing, Adjusting, and Balancing Equipment:
 - a. Heat exchangers.

- b. Motors.
 - c. Condensing units.
 - d. Heat-transfer Equipment.
4. Testing, adjusting, and balancing existing systems and equipment.
 5. Control system verification.

1.03 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

1.04 PREINSTALLATION MEETINGS

- A. TAB Conference: A TAB conference at the Project site will be conducted at the Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days advance notice of scheduled meeting time and location.
 1. Minimum Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Needs for coordination and cooperation of trades and subcontractors.
 - d. Proposed procedures for documentation and communication flow.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 60 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 60 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. System Readiness Checklists: Within 60 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.

- E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- F. Certified TAB reports.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.06 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC or NEBB.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.
 - 2. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.07 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer units for correct piping connections and piping accessories.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.02 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.

- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.
 - j. Suitable access to balancing devices and equipment is provided.

 - 2. Hydronics:
 - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
 - b. Piping is complete with terminals installed.
 - c. Water treatment is complete.
 - d. Systems are flushed, filled, and air purged.
 - e. Strainers are pulled and cleaned.
 - f. Control valves are functioning per the sequence of operation.
 - g. Shutoff and balance valves have been verified to be 100 percent open.
 - h. Pumps are started and proper rotation is verified.
 - i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
 - j. Variable-frequency controllers' startup is complete and safeties are verified.
 - k. Suitable access to balancing devices and equipment is provided.

3.03 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.05 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.

- c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 4. Obtain approval from Architect/Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 6. Measure and record all operating data.
 7. Record final fan-performance data.

3.06 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.07 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

3.08 DUCT LEAKAGE VERIFICATION

- A. Measure total system flows at the fan inlet and outlets and compare to total flow at the individual air devices.
- B. Variances greater than 10% between fan measurements and summed air devices measurements will require individual duct leakage test for the system. Verify that proper test methods are used and that leakage rates are within specified tolerances.
- C. Report continued deficiencies observed for correction prior to final report.

3.09 CONTROLS VERIFICATION

- A. In conjunction with system balancing, perform the following:
1. Verify temperature control system is operating within the design limitations.
 2. Confirm that the sequences of operation are in compliance with Contract Documents.
 3. Verify that controllers are calibrated and function as intended.
 4. Verify that controller set points are as indicated.
 5. Verify the operation of lockout or interlock systems.
 6. Verify the operation of valve and damper actuators.
 7. Verify that controlled devices are properly installed and connected to correct controller.
 8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
 9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.
- B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.10 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Equal or plus 10 percent.
 - 2. Air Outlets and Inlets: Equal or plus 10 percent.
 - 3. Condenser loop and tower water Flow Rate: Plus or minus 10 percent
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.11 PROGRESS REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare preliminary progress reports to describe completed procedures, procedures in progress, and scheduled procedures at the 25%, 50% and 75% completion levels. Include a list of deficiencies and problems found in systems being tested and balanced.

3.12 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
 - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Pump curves.
 - 2. Fan curves.
 - 3. Manufacturers' test data.
 - 4. Field test reports prepared by system and equipment installers.
 - 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB specialist.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.

10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water and steam flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.

- e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).
3. Test Data (Indicated and Actual Values):
- a. Total airflow rate in cfm .
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg .
 - e. Filter static-pressure differential in inches wg .
 - f. Preheat-coil static-pressure differential in inches wg .
 - g. Cooling-coil static-pressure differential in inches wg .
 - h. Heating-coil static-pressure differential in inches wg).
 - i. Outdoor airflow in cfm .
 - j. Return airflow in cfm .
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
 - m. Vortex damper position.
- F. Apparatus-Coil Test Reports:
1. Coil Data:
- a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Make and model number.
 - f. Face area in sq. ft..
 - g. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
- a. Airflow rate in cfm .
 - b. Average face velocity in fpm .
 - c. Air pressure drop in inches wg.
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F .
 - e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Water flow rate in gpm (L/s).
 - i. Water pressure differential in feet of head or psig.
 - j. Entering-water temperature in deg F.
 - k. Leaving-water temperature in deg F. .
 - l. Refrigerant expansion valve and refrigerant types.
 - m. Refrigerant suction pressure in psig.
 - n. Refrigerant suction temperature in deg F.
 - o. Inlet steam pressure in psig.
- G. Gas-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
1. Unit Data:
- a. System identification.

- b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Fuel type in input data.
 - g. Output capacity in Btu/h.
 - h. Ignition type.
 - i. Burner-control types.
 - j. Motor horsepower and rpm.
 - k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
 - m. Sheave make, size in inches, and bore.
 2. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Entering-air temperature in deg F.
 - c. Leaving-air temperature in deg F.
 - d. Air temperature differential in deg F.
 - e. Entering-air static pressure in inches wg.
 - f. Leaving-air static pressure in inches wg.
 - g. Air static-pressure differential in inches wg.
 - h. Low-fire fuel input in Btu/h.
 - i. High-fire fuel input in Btu/h.
 - j. Manifold pressure in psig.
 - k. High-temperature-limit setting in deg F.
 - l. Operating set point in Btu/h.
 - m. Motor voltage at each connection.
 - n. Motor amperage for each phase.
- H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
 1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Coil identification.
 - d. Capacity in Btu/h.
 - e. Number of stages.
 - f. Connected volts, phase, and hertz.
 - g. Rated amperage.
 - h. Airflow rate in cfm.
 - i. Face area in sq. ft.
 - j. Minimum face velocity in fpm.
 2. Test Data (Indicated and Actual Values):
 - a. Heat output in Btu/h.
 - b. Airflow rate in cfm.
 - c. Air velocity in fpm.
 - d. Entering-air temperature in deg F.
 - e. Leaving-air temperature in deg F.
 - f. Voltage at each connection.
 - g. Amperage for each phase.

- I. Fan Test Reports: For supply, return, and exhaust fans, include the following:
 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft.
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- K. Air-Terminal-Device Reports:
 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.

- d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft.
2. Test Data (Indicated and Actual Values):
- a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- L. Instrument Calibration Reports:
1. Report Data:
- a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.13 VERIFICATION OF TAB REPORT

- A. Architect/Engineer shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- B. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- C. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- D. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
- E. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions. Summer testing shall occur in June, July, or August. Winter testing shall occur in December, January or February, Testing outside these periods shall be performed with written permission of the Architect.

END OF SECTION 23 05 93

SECTION 23 07 00

HVAC INSULATION

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 insulating the following duct and piping services:
1. Indoor, concealed supply, return and outdoor air.
 2. Indoor, exposed supply, return and outdoor air.
 3. Indoor, Type I, commercial, kitchen hood exhaust.
 4. Indoor, exhaust between isolation damper and penetration of building exterior.
 5. Outdoor, concealed supply and return.
 6. Outdoor, exposed supply and return.
 7. Refrigerant piping
 8. Duct liner
 9. Indoor, Condensate piping
- B. Related Sections:
1. Section 23 07 16 "HVAC Equipment Insulation."
 2. Section 23 31 13 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 3. Detail application of field-applied jackets.
 4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
 - 1. Aeroflex, Armacell, K-Flex
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket
 - 1. CertainTeed, Johns-Manville, Knauf, Owens Corning, and Manson
- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket.
 - 1. CertainTeed, Johns-Manville, Knauf,, Owens Corning
- H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less.
 - 1. CertainTeed, Johns-Manville, Knauf,, Owens Corning
- I. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard." Ductwork dimensions shown on the plans are internal dimensions. Ductwork shall be increased in size to accommodate duct liner.
 - 1. Manufacturers: Subject to compliance with requirements:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 2. Performance
 - 1) Building Interior: Type I, Flexible: R-6, 1.5" thick, 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 2) Building Exterior: Type I, Flexible: R-8, 2" thick

3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
- J. Insulation Pins and Washers:
 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- or 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - K. Mineral-Fiber, Preformed Pipe Insulation:
 1. Manson, Johns-Manville, Knauf,, Owens Corning
 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL.
 - L. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
 1. Armacell, Nomaco, and K-Flex

2.2 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.
 1. Johns Manville, CertainTeed, Thermal Ceramics

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 1. Foster K-Flex, Aerocell, Armacell
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. Foster, Childers, Eagle, Mon-Eco
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 1. Foster, Childers, Eagle, Mon-Eco[≥]
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
 1. CertainTeed, Johns-Manville, Knauf,, Owens Corning_MASTICS

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic, Water based; suitable for indoor use on below ambient services.
 - 1. Foster, Knauf, Vimason
 - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mildry film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
 - 1. Childers Brand, Eagle Bridges, Foster Brand
 - 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mildry film thickness.
 - 3. Service Temperature Range: Minus 50 to plus 220 deg F.
 - 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 - 5. Color: White.

2.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Foster, Childers, Eagle, Mon-Eco
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 5. Color: Aluminum.
- B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
 - 1. Foster, Childers, Eagle, Mon-Eco
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 5. Color: White.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. Johns Manville, Proto, P.I.C. Plastics
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White
 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Metal Jacket:
 1. Childers, ITW Insulation Systems RPR Products
 2. Aluminum Jacket: Comply with ASTM B 209
 - a. Factory cut and rolled to size
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier
 - d. 3-mil-thick, heat-bonded polyethylene and kraft paper or 2.5-mil thick polysurlyn.
 - e. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- D. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
 1. Pittsburg Corning, Polyguard Products or approved equal

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Knauf, Ideal, Compac, Avery, Venture
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Knauf, Ideal, Compac, Avery, Venture
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Knauf, Ideal, Compac, Venture
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Knauf, Ideal, Compac, Avery, Venture
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

- A. Bands:
1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal.
- B. Insulation Pins and Hangers for duct:

1. Capacitor-Discharge-Weld Pins: Zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
 - b.
- C. Duct Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- D. Duct Wire: 0.062-inch soft-annealed, stainless steel. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain subparagraph and list of manufacturers below. See Section 016000 "Product Requirements."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL DUCT INSULATION INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.

- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Additional #18 gauge stainless steel wire on 2 foot centers, shall be installed for all ductwork with dimensions greater than 12" to prevent sagging. All punctures in vapor barrier shall be sealed. All joints shall be lapped and wired. Staples and tape alone for ductwork with dimensions greater than 12" will not be acceptable. Where service access is required, bevel and seal ends of insulation. For insulated ductwork exposed in mechanical rooms and located less than 8'-0" above finished floor, cover with 24 Ga. aluminum jacket.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 Shop Application of Duct Liner:

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
 7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
 8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
 9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
 10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces shall be covered with a metal jacket.

3.6 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
1. Comply with requirements in Section 078413 "Penetration Firestopping."
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER DUCT INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive, tape, staples and wire wrap.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces with sides or bottoms greater than 36".
2. Apply adhesive to entire circumference of all duct joints and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. Additional #18 gauge stainless steel wire on 4 foot centers, shall be installed for all ductwork with dimensions greater than 12" to prevent sagging. All punctures in vapor barrier shall be sealed. All joints shall be lapped and wired. Staples and tape alone for ductwork with dimensions greater than 12" will not be acceptable. Where service access is required, bevel and seal ends of insulation.
 - b. Do not over compress insulation during installation.
 - c. Impale insulation over pins and attach speed washers.
 - d. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - e. For insulated ductwork exposed in mechanical rooms and located less than 8'-0" above finished floor, cover with 24 Ga. aluminum jacket.
4. For ducts and plenums install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.9 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
 - 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.11 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.12 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return.
 - 4. Indoor, exposed return.
 - 5. Exhaust Ductwork
 - 6. All duct associated with energy recovery unit including exhaust ductwork.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.13 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. All return air, outdoor air intake, supply air, ERU supply, ERU return and any ducts with an internal temperature below 65 degrees F shall be insulated with mineral-fiber blanket: 2" thick and 0.75 lb/ft³ nominal density.

3.14 PIPING INSULATION

- A. All HVAC piping, other than heat pump loop piping, shall be insulated with minimum 1/2" thickness fiberglass or flexible Elastomeric insulation unless noted otherwise below.
- B. Condensate and Equipment Drain Water below 60 Deg F:
1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 1/2 inch thick.
 - b. Polyolefin: 1/2 inch thick.
- C. Refrigerant Suction and Hot-Gas Tubing:
1. All Pipe Sizes: Insulation shall be the following: (exterior locations require minimum 0.016 aluminum jacket over the insulation)
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Polyolefin: 1 inch thick.

3.15 INDOOR PIPING, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed and exposed:
1. PVC 20 mils thick.

3.16 OUTDOOR PIPING, FIELD-APPLIED JACKET SCHEDULE, ABOVE GROUND

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. Applies to exterior located refrigerant piping insulation.
- B. If more than one material is listed, selection from materials listed is Contractor's option.

- C. Piping, Concealed and exposed:
 - 1. Aluminum, Smooth 0.040 inch thick.

END OF SECTION 23 07 00

**SECTION 23 0900
HVAC INSTRUMENTATION AND CONTROLS**

PART 1 - GENERAL

1.01 OVERVIEW

- A. This section covers labor, services, apparatus, wiring, piping and materials for and incidental to the installation of a system of automatic and manual controls.
- B. All control, interlock and starting circuit wiring, except where otherwise specified or noted on the drawings, shall be furnished under this Section.
- C. Starters and contactors shall be provided for motors and electric loads where these devices are not provided as part of the equipment served.

1.02 QUALITY ASSURANCE

- A. Control installation work shall be performed by mechanics regularly employed in the installation of control systems. Control devices shall be Honeywell, Johnson Controls, Robertshaw, or Barber Coleman. All control devices shall be by one manufacturer.

1.03 SHOP DRAWINGS

- A. Submittals shall include a proposed wiring diagram with accompanying complete typewritten sequence of operations. A symbols list defining all abbreviated components shall be included. A cut sheet on each component used in the system shall be included.
- B. A copy of record control diagrams shall be framed under glass and mounted in the mechanical room. An extra copy of each shall be included in each operational and maintenance manual.

1.04 GUARANTEE

- A. Upon completion of the installation and before final inspection, the Contractor shall regulate and adjust all control devices and equipment provided under this contract and shall place them in complete operating condition subject to the approval of the Architect/Engineer.
- B. The Contractor shall, after completion of the original installation, provide any service incidental to the proper performance of the building control system for a period of one year from date of beneficial occupancy.

1.05 WIRING

- A. Provide all wiring between fans, heaters, thermostats, roof top units, etc., and all equipment as necessary to achieve the specified sequence of operation.
- B. All wiring required for building control system, including electrical interlock wiring, shall be provided by the Contractor. Detailed control wiring diagrams and necessary supervision shall be provided by the Contractor. The term "wiring" shall include wire, conduit, miscellaneous material and labor required for mounting and wiring electrical and electronic control devices.

1.06 SYSTEM ACCEPTANCE

- A. The system installation shall be complete in all respects and tested for proper operation prior to acceptance testing by the Owner's representative. A letter shall be submitted to the Engineer requesting system acceptance testing. This letter shall certify that all controls are installed and have been completely exercised for proper operation. When the system has been deemed satisfactory in whole by the Owner's representative, the system shall be accepted for beneficial use which shall start the warranty period.

1.07 LABELS

- A. All controls shall be labeled with plastic labels corresponding to the control drawing designation. Labels shall be engraved plastic at individual controls and panels. Room thermostat shall be embossed plastic inside the cover.

1.08 MAINTENANCE MANUALS AND INSTRUCTIONS

- A. Provide operating and maintenance manuals as specified in Section 15010 and include final corrected copies of control diagrams that include all changes made prior to completion of the installation. Post a copy of the final corrected control diagrams laminated in plastic in the mechanical equipment room.
- B. Furnish a minimum of 2 hours on-site instruction for the Owner's operators and maintenance personnel. Training shall be provided during normal working hours.
- C. Training shall include system wiring and operation, unit mounted controls locations and service emergency fixtures, alarms, re-set, service requirements, etc., as required to properly instruct Owner's personnel.

1.09 WORK BY OTHERS

- A. The Contractor shall coordinate with work by other trades prior to installation of control system.
- B. The sheet metal contractor shall verify required control damper quantities and sizes before dampers are ordered. Sheet metal contractor shall receive dampers at the job site, set dampers in place and shall provide access doors for dampers. The damper shaft shall be extended at a location that provides space for the actuator.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All controls shall be electric/electronic. All controls shall be fully modulating unless otherwise specified. All controls shall be fully adjustable to meet job conditions.

2.02 THERMOSTATS (PROGRAMMABLE)

- A. Thermostat Manufacturers:
 - 1. Basis of design: Honeywell model Wi-Fi VisionPro 8000.
 - 2. Equals: Carrier and Trane
- B. Thermostats serving all new units providing heating, cooling, and dehumidification and shall be multi-stage (as required by equipment served), automatic changeover type. Thermostats shall be designed to communicate over wi-fi through the thermostat app installed on smart phones and tablets.

1. Thermostats shall include minimum 10-hour battery back-up and manual override of two hours.
 2. Thermostats shall include available system settings of COOLING-HEATING-DEHUMIDIFICATION-AUTOMATIC-OFF and available fan settings of ON-AUTOMATIC-OFF.
 3. Thermostat shall be provided with a dehumidification setting range of 40%-60%RH.
 4. Humidity display range shall be 0%-99%RH
 5. Thermostat sensor accuracy shall +/- 1.5F at 70F.
 6. Thermostat shall be accessible remotely via smartphone, tablet or computer.
 7. Thermostat shall be equipped with a touchscreen display with a 2-line message center.
 8. Thermostat shall communicate with smartphones, tablets by Wi-Fi. Wi-Fi connections shall be via 802.11 b/g/n routers.
- C. Thermostats serving fans or heaters shall be designed for the service required – heating only or cooling only.
- D. All thermostats shall be provided with lockable covers, Kendall TG-1 or approved equal. Submit item for engineer and owner review.

2.03 TIMERS

- A. Timers shall be M. H. Rhodes Model 93000 series or equal, 2-hour timers without hold feature.

2.04 MISCELLANEOUS

- A. Miscellaneous controls and accessories such as relays, switches, etc., required for the complete control system shall be heavy duty type suitable for the service and shall be standard products of the control manufacturer.

2.05 MOTOR STARTERS AND CONTACTORS

- A. Furnish individual automatic motor starters for all single or three phase motors.
- B. Starters shall be furnished with individual phase thermal overload protection, and with two (2) normally open auxiliary contacts, "Hand-Off-Auto" switch, 24 VAC coil, 24 VAC control transformer, and pilot light.
- C. Single phase fractional horsepower motors shall have internal thermal overload protection.
- D. Interior mounted starters shall be mounted in individual Nema-1 enclosures.
- E. Motor starters shall be General Electric or approved equal by Square-D, Westinghouse, Allen-Bradley, Furnas or Joslyn Clark.
- F. Voltage for holding coils shall not exceed 120 volts. Provide built-in transformers with fuses. Provide auxiliary contacts as required by control circuits.
- G. Each starter shall be provided engraved laminated plastic nameplates describing the piece of equipment being served.

2.06 WIRING AND CONDUIT

- A. Wiring shall be run in conduit with outlet boxes and fittings equal to those specified under Division 26. Line voltage wiring shall be no smaller than 14-gauge, 600-volt wire.
- B. Wiring shall be concealed in all finished areas.

2.07 CONTROL TRANSFORMERS

- A. Provide and locate on the wall under the control panel, the control transformer, 120 VAC/24 VAC, 250 VA. Provide surge suppressor protection on the primary, and circuit breaker located inside the zone control panel, for the secondary. The primary shall be powered from a dedicated 20-amp circuit breaker in the electrical panel and labeled as temperature controls, coordinate with electrical contractor.

2.08 SAFETY THERMOSTATS

- A. Fire protection thermostats shall be manual reset type (per NFPA 90A) or shall require some manual operation (As pushing a "Start" button on a motor starter) to restart fan operations.

2.09 EQUIPMENT SAFETY CONTROLS

- A. Manufacturers of A/C units, heaters, fans, etc., shall be responsible for providing operation and safety controls mounted and wired complete from factory.

2.10 CONTROL PANELS

- A. Control panels shall be dust tight and furnished with hinged locking doors. Provide an engraved nameplate on the face of the panel clearly describing its function, all devices inside shall be clearly labeled. All wiring within the panel shall be in accordance with NEMA, UL, NEC and local codes.
- B. All relays, transducers, area controllers, local controllers, etc., shall be mounted within control panels.

2.11 RELAYS

- A. All relays shall be plugged in, interchangeable, mounted on circuit board and wired to numbered terminal strips.
- B. Start/Stop relays shall provide either momentary or maintained switching action appropriate for the motor being controlled.

2.12 PANEL WIRING

- A. All wiring in the control panel shall be 24VAC and shall be run in track with cover. All wire shall be 600V insulated, #16 THHN, and each wire shall be individually numbered. Wire color shall be blue for all 24VAC "HOT", and yellow for all 24VAC "COMMON". Exception: The blue and yellow wire from the transformer secondary shall be #12, 600V.

2.13 SMOKE DETECTORS

- A. Smoke detectors approved for duct installation shall be provided by Division 26 for all air systems of 2000 cfm capacity or above or as indicated on the drawings, to automatically shut down the supply fan and close all smoke dampers (as required). Each detector shall have an integral relay and be capable of operating a remote. All wiring shall be in conduit.

- B. Smoke detectors shall be furnished by Division 26 and installed under Division 23. All wiring between detector and fire alarm system shall be provided and installed under Division 26. All wiring between detector and unit and between detector and unit served shall be provided and installed under Division 23. All wiring shall be in conduit.

2.14 DAMPER ACTUATORS

- A. Damper actuators shall be 120 volt or 24-volt proportional motor operators. Any transformers and/or wiring required to utilize available power shall be provided by this contractor.

PART 3 - EXECUTION

3.01 DEVICE LOCATIONS

- A. Unless otherwise noted, install room thermostats, instruments, and panels 4'-0" above floor.
- B. Room thermostats shall be located where shown on floor plans. Coordinate location and conduit runs with the electrical contractor. Coordinate thermostat location so as not to interfere with casework, etc.

3.02 IDENTIFICATION

- A. Controls, switches, night thermostats, starters, contactors and related devices shall be identified with engraved laminated plastic nameplates. Plate shall show function, system and control device identification number as indicated on the control drawing.

3.03 CONTROL WIRING

- A. All control wiring shall be run in metal conduit with outlet boxes and fitting equal to those specified under Division 26. Line voltage wiring shall be no smaller than 14-gauge, 600-volt wire. All conduit shall be located in wall cavity or above ceilings. Wall surface mounted conduit shall be prohibited. Plenum rated cable routed exposed shall be prohibited. All wiring below grade shall be conduit.
- B. Install control, pilot circuit and interlock wiring including wiring through interposed safety or auxiliary control devices required for operation of the equipment. All wiring in wall cavities and exposed in mechanical or electrical rooms or above the roof shall be run in conduit. At roof penetrations, wiring shall be run in conduit - conduit penetrations shall be thru roof curbs. All wiring routed in ceiling spaces may be run without conduit but shall be fastened to structural components at a maximum of 6'-0" o.c. Control and/or interlock wiring shall not be run in conduit with any power wiring other than that serving the equipment controlled.
- C. Electrical wiring shall conform in all respects with the provisions of the National Electrical Code and the Electrical work specifications of Division 26.
- D. Wires shall be identified at both ends with numbered labels to correspond to conductor numbers on the control diagrams.
- E. Control voltage shall be a maximum of 24V, unless otherwise indicated, specified or required.
- F. Wiring connections to terminal posts shall be made by means of compression type lugs. Wire splices shall be made with scotch locks.

- G. Provide a separate numbered terminal connection for each wire entering panel.
- H. Safety devices in motor control circuits shall be wired to interrupt the holding coil circuit, regardless of the position of any selector switches in the circuit.
- I. Control circuit conductors shall be sized for a minimum voltage drop between the supply device and the farthest controlled device. Minimum wire size shall be No. 16.

3.04 FIRE ALARM INTERLOCK, EQUIPMENT INTERLOCK AND EMERGENCY

- A. Provide relays and interlock wiring in the starting circuits of all air moving equipment to stop operation when the building fire alarm system is activated. Contacts shall be installed in the central fire alarm panel for this signal; coordinate with fire alarm panel furnished under Division 26.
- B. Interlock, relays, etc., shall meet the expressed requirements of NFPA Code 90A.
- C. Provide on the wall of the Elect. 404.1 an "Emergency Stop" switch. Switch shall be labeled "Emergency Fan Shutdown Switch" and be located adjacent to room thermostat. Switch shall be wired so that all air moving equipment will immediately shut down when switch is depressed.
- D. Provide all interlock wiring between air-conditioning units, fans, thermostats, and other related equipment as necessary to achieve the specified operating sequence.

3.05 SYSTEM CONFIGURATION

- A. Individual thermostats in each space shall energize the respective HVAC units. The evaporator fan shall run continuously during occupied hours and cycle thru the night setback/setup thermostat setting during nighttime hours. Heating and cooling shall be thermostatically controlled (set 75 degrees F. cooling, 70 degrees F. heating, adjustable).
- B. The thermostats' night setback shall be set to 65 degrees F heating, night set-up shall be set 80 degrees F cooling and night setback shall be set to 60%RH dehumidification. All settings shall be adjustable.
- C. Coordinate owner occupied and unoccupied hours for system configuration.
- D. Exhaust fan controls shall be per fan schedule notes.
- E. Heaters shall be controlled by integral thermostats.

PART 4 - SEQUENCE OF OPERATION

4.01 SINGLE ZONE SPLIT SYSTEM UNITS

- A. Control module shall be provided for each unit to control the fan, compressor, reversing valve and electric heat.

Start/Stop

Cool 1 / Cool 2 or more if unit is capable – refer to equipment submittal

Heat 1 / Heat 2 or more if unit is capable – refer to equipment submittal

Hot Gas Reheat Enable / Disable

Outside Air Enable / Disable

- B. A wall mounted temperature thermostat located in the space shall provide an analog input signal to the unit's control module. A duct mounted humidity sensor shall be located in the return ductwork, which shall provide an analog input signal to the control module.
- C. Each unit shall be programmed to start and stop according to the day/night schedule provided by the Owner.
- D. The unit fan shall run continuously in the day cycle.
- E. On a rise in space temperature above the cooling set point, the compressor shall start. Provide two stage control for units with two steps of capacity.
- F. On a rise in space humidity above the relative humidity set point and no rise in space temperature above the cooling set point, the compressor(s) shall start and the hot gas reheat coil shall be activated. The humidity sensor shall be located in the return ductwork.
- G. On a drop in space temperature below the heating set point, the heat pump heat shall start as first stage. On a further drop in space temperature more than one degree out of setpoint, the second stage electric heater shall be on.
- H. In the night cycle the unit fan shall be off. On a drop in space temperature below the night setting of 55 degrees F., the fan and the gas heat shall start.

4.02 EXHAUST FANS

- A. See fan schedule for type of control for each fan.

4.03 ELECTRIC HEATERS

- A. Units shall be controlled by integral thermostat.

4.04 PROJECT START-UP

- A. Controls Contractor shall make out start-up cards for all unit and system controllers, as per start up card furnished below, and shall furnish same at Final Completion of project.
- B. Final submittal of start-up cards shall be bound in a PDF file, collated with unit start-up cards by unit number. Start-up cards shall be in ascending order by unit number with the unit start-up card located before the programming start-up card. Different types of equipment (fan-coil units, rooftop units, etc.) shall be separated with clearly labeled tabs.

4.05 FIRE ALARM INTERLOCK

- A. Contractor shall interlock new duct mounted smoke detectors with the central fire alarm control panel with wiring to contacts, a controller, and programming. Control points for interface with the fire alarm control panel shall be provided for the following:
Alarm – An alarm signal from the fire alarm shall shut-down the HVAC
Trouble

4.06 SYSTEM ACCEPTANCE

- A. Reference section 01770 for general requirements.

4.07 CLOSEOUT DOCUMENTATION

- A. Properly completed start-up forms, including the form shown below, documenting proper field quality control and demonstration as outlined in section 1.5 above, shall be received by the Owner prior to granting of substantial completion.

END OF SECTION 230900

SECTION 23 21 13

HYDRONIC PIPING

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 pipe and fitting materials and joining methods for the following:
 1. Condenser-water loop and cooling tower piping.
 2. Condensate-drain piping.
 3. Blowdown-drain piping.
 4. Air-vent piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 1. Plastic pipe and fittings with solvent cement.
 2. Steel Piping and Fittings.
 3. Chemical treatment.
- B. Delegated-Design Submittal:
 1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
 2. Locations of pipe anchors and alignment guides and expansion joints and loops.
 3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
 4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.4 SUBMITTALS

- A. Product Data: For each type of the following: Pressure-seal fittings.
 1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
 2. Air control devices.
 3. Hydronic specialties.
- B. Shop Drawings: Detail, at 1/4 scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the

same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

- C. Welding certificates.
- D. Qualification Data: For Installer.
- E. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Condensate-Drain Piping: 150 deg F
 - 2. Blowdown-Drain Piping: 100 psig at 200 deg F
 - 3. Air-Vent Piping: 110 psig at 200 deg F
 - 4. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L
- B. DWV Copper Tubing: ASTM B 306, Type DWV.
- C. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- H. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.4 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- F. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for CPVC Piping: ASTM F 493.
- H. Solvent Cements for PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

- I. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.5 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
 - 1. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.
- B. Plastic-to-Metal Transition Unions:
 - 1. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

2.6 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.
 - 2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180°F.
- D. Dielectric Nipples:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Perfection Corporation; a subsidiary of American Meter Company.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - 2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Condensate-Drain Interior Piping: Type L, drawn-temper copper tubing, wrought-copper fittings, soldered joints and Viega ProPress system.
- B.

- C. Condensate-Drain Exterior Piping: Type L, drawn-temper copper tubing, wrought-copper fittings, soldered joints and Viega ProPress system.
- D. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
- E. Air-Vent Piping:
 - 1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
 - 2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
- F. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the side of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Section 23 05 23 "General Duty Valves for HVAC Piping,"
- Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Provide expansion loops, expansion joints, anchors, and pipe alignment guides for straight piping runs exceeding 100'.
- U. Comply with requirements in Section 23 05 53 "Identification for HVAC Piping and Equipment" for identifying piping.
- V. Install sleeves for piping penetrations of walls, ceilings, and floors.
- W. Install sleeve seals for piping penetrations of concrete walls and slabs.
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for up to NPS 4: Use dielectric unions.
- C. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
 - 2. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 - 3. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4 : Maximum span, 7 feet.

2. NPS 1: Maximum span, 7 feet.
 3. NPS 1-1/2: Maximum span, 9 feet.
 4. NPS 2: Maximum span, 10 feet.
 5. NPS 2-1/2 : Maximum span, 11 feet.
 6. NPS 3 and Larger: Maximum span, 12 feet.
- D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4 : Maximum span, 5 feet ; minimum rod size, 1/4 inch.
 2. NPS 1 : Maximum span, 6 feet ; minimum rod size, 1/4 inch.
 3. NPS 1-1/4 :Maximum span, 7 feet ; minimum rod size, 3/8 inch.
 4. NPS 1-1/2 : Maximum span, 8 feet ; minimum rod size, 3/8 inch.
 5. NPS 2 : Maximum span, 8 feet ; minimum rod size, 3/8 inch .
 6. NPS 2-1/2 : Maximum span, 9 feet ; minimum rod size, 3/8 inch.
 7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- E. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.
- F. Fiberglass Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.
- G. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
1. Victaulic couplings may be used in lieu of welded joints provided couplings and coupling installers meet the following requirements. Couplings and coupling installers must meet the following requirements. Contractor shall ensure each coupling installer has been trained

on-site by a direct employee of Victaulic or Grinnell in the use of grooving tools, application of groove, and product installation. Contractor shall submit to the engineer documentation signed and dated by Victaulic or Grinnell, showing the names of the installers that have completed jobsite training. A manufacturer's direct employee shall perform periodic inspections and provide the engineer a report for each inspection. A minimum of 3 (beginning, middle and end of pipe installation) inspections shall be performed. Couplings installed that are not per manufacturer's guidelines will need to be replaced at the contractor's expense. Any damages or owner expenses incurred during contractor's warranty period, due to improper installation, will be the responsibility of the installing contractor. Fittings shall be rigid couplings rated for minimum of 350 psi, Victaulic Style #107, W07 or Grinnell equal. Couplings installed that are not per manufacturer's guidelines will need to be removed and replaced at the contractor's expense. Coupling gasket shall be constructed of grade "EHP" EPDM rated for a temperature range of -30F to 250F. Contractor's field personnel installing the mechanical couplings shall be certified by a factory employed representative. Installer shall follow all the manufacturer's installation requirements. All grooved products shall be from a single manufacturer. A one (1) year warranty shall be provided for mechanical couplings.

- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- H. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.
- I. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.
- L. Press Fittings: Copper and Copper alloy press fittings. ASME B16.18 or ASME and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EDPM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall have SC (Smart Connect) feature design. The press fitting installation shall be per the manufacturer's instructions. All the manufacturer's requirements shall be followed.

3.6 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.

3. Isolate expansion tanks and determine that hydronic system is full of water.
 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare written report of testing.
- C. Perform the following before operating the system:
1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION 23 21 13

SECTION 23 23 00

REFRIGERANT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.03 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
 - 2. Suction Lines for Heat-Pump Applications: 535 psig.
 - 3. Hot-Gas and Liquid Lines: 535 psig.

1.04 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
 - 1. Thermostatic expansion valves.
 - 2. Solenoid valves.
 - 3. Pressure-regulating valves.
- B. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.06 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.07 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.01 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type L or ASTM B 280, Type ACR.

- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Sporlan/Parker ZoomLock

2.02 VALVES AND SPECIALTIES

- A. Check Valves:
 - 1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 - 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 - 3. Piston: Removable polytetrafluoroethylene seat.
 - 4. Closing Spring: Stainless steel.
 - 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 - 6. End Connections: Socket, union, threaded, or flanged.
 - 7. Maximum Opening Pressure: 0.50 psig.
 - 8. Working Pressure Rating: 500 psig.
 - 9. Maximum Operating Temperature: 275 deg F.
- B. Service Valves:
 - 1. Body: Forged brass with brass cap including key end to remove core.
 - 2. Core: Removable ball-type check valve with stainless-steel spring.
 - 3. Seat: Polytetrafluoroethylene.
 - 4. End Connections: Copper spring.
 - 5. Working Pressure Rating: 500 psig.
- C. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
 - 1. Body and Bonnet: Plated steel.
 - 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 - 3. Seat: Polytetrafluoroethylene.
 - 4. End Connections: Threaded.
 - 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24, 115, or 208-V ac coil.
 - 6. Working Pressure Rating: 400 psig.
 - 7. Maximum Operating Temperature: 240 deg F.
 - 8. Manual operator.
- D. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
 - 1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 - 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 - 3. Seat Disc: Polytetrafluoroethylene.
 - 4. End Connections: Threaded.
 - 5. Working Pressure Rating: 400 psig.
 - 6. Maximum Operating Temperature: 240 deg F.
- E. Thermostatic Expansion Valves: Comply with ARI 750.
 - 1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 - 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 - 3. Packing and Gaskets: Non-asbestos.
 - 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.

5. Suction Temperature: 40 deg F.
 6. Superheat: Adjustable.
 7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 450 psig.
- F. Moisture/Liquid Indicators:
1. Body: Forged brass.
 2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
 3. Indicator: Color coded to show moisture content in ppm.
 4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
 5. End Connections: Socket or flare.
 6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 240 deg F.
- G. Mufflers:
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or flare.
 3. Working Pressure Rating: 500 psig.
 4. Maximum Operating Temperature: 275 deg F.
- H. Liquid Accumulators: Comply with ARI 495.
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or threaded.
 3. Working Pressure Rating: 500 psig.
 4. Maximum Operating Temperature: 275 deg F.

2.03 REFRIGERANTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Atofina Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
 4. INEOS Fluor Americas LLC.
- B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
- B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
- C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.02 VALVE AND SPECIALTY APPLICATIONS

- A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

- B. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- C. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.
- D. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- E. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- F. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

3.03 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
- R. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."
- S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
- U. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.
- V. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.04 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Press Fittings: The press fitting installation shall be per the manufacturer's instructions. All the manufacturer's requirements shall be followed.

3.05 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 - 2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 - 3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
 - 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 - 2. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
 - 3. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
 - 4. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.
- E. Support multi-floor vertical runs at least at each floor.

3.06 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 - 4. Charge system with a new filter-dryer core in charging line.

3.07 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.

5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 23 00

SECTION 23 31 13

DUCTWORK

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. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Double-wall round ducts and fittings.
 - 4. Sheet metal materials.
 - 5. Duct liner. Refer to 23 07 00.
 - 6. Sealants and gaskets.
 - 7. Hangers and supports.
 - 8. Exterior ducts and fittings.
- B. Related Sections:
 - 1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
 - 2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1.4 SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Liners and adhesives.
 - 2. Sealants and gaskets.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
 - f. Impulse Air
 - g. Silver Sheet Enterprises, Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 DOUBLE-WALL ROUND DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements:
1. Lindab Inc.
 2. McGill AirFlow LLC.
 3. SEMCO Incorporated.
 4. Sheet Metal Connectors, Inc.
 5. Impulse Air
 6. Silver Sheet Enterprises, Inc.
- B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch-diameter perforations, with overall open area of 23 percent.
- D. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
 2. Coat insulation with antimicrobial coating.
 3. Cover insulation with polyester film complying with UL 181, Class 1.

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections. Minimum gauge of sheet metal shall be as specified below:

<u>GREATEST DIMENSION</u>	<u>MIN. U. S. GAUGE</u>
0" - 12"	26
13" - 30"	24
31" - 54"	22
55" - 84"	20
85" and above	18
Plenum	22

Gauges above are minimum thickness of metal and exceed SMACNA standards in many cases.

- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

- A. Refer to specification section 20 07 00. The first 10 feet of supply ductwork from an air conditioning unit shall be internally insulated unless noted otherwise. The entire length of the return duct work shall be internally insulated.

2.6 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

- E. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for static-pressure class, positive or negative.
 - 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

2.8 EXTERIOR DUCTS

- A. All exterior exposed ductwork sections shall be connected using a system consisting of minimum 18 gauge galvanized steel with an integral sealant to create an airtight transverse joint. The system shall utilize a neoprene or extruded butyl gasketing between mating flanges the entire length of the joint. The connection system shall be comparable to a S.M.A.C.N.A. class "J" transverse joint. Each transverse joint shall be weatherproofed using a continuous U.L. listed metal cleat applied over the entire joint. The system shall be by Ductmate Industries, Inc., Ward Duct Connector, Inc., or Engineer and Owner approved equal.
- B. All exterior duct shall be constructed to meet SMACNA standards for min. 4" w.c. static pressure. Intermediate section supports shall be angle iron or tie rod type sized per the S.M.A.C.N.A. HVAC Duct Construction Standards - Metal and Flexible - 1995 edition. Reinforcement shall be provided on all sides of duct.
- C. All exterior ductwork joints, reinforcements, and longitudinal seams shall be sealed with Sonneborn "Sonolastic NP-1" urethane sealant. Exterior ductwork shall be sealed, wiped, and cleaned with mineral spirits, and finished with a minimum of two coats of galvanized primer. The color of sealant and primer shall be matched, with color selected by the Owner.

- D. All exterior ductwork shall be properly sealed to building at penetrations to prevent water entry to building and duct interior.
- E. All exterior ductwork shall be primed and painted with a minimum of 2 coats of architect selected color. Coordinate paint requirements with general division.

2.9 KITCHEN HOOD EXHAUST DUCT

- A. Refer to specification section 23 38 13 Commercial Kitchen Hoods for ductwork requirements.

2.10 DISHWASHER AND FUME HOOD EXHAUST DUCT

- A. Exhaust ductwork shall be fabricated from minimum 18 gauge 316 stainless steel, with all seams welded and polished. Exhaust duct shall be constructed of the best stainless steel sheet metal sheets, free from blisters and imperfections. Duct exposed to view shall have a No. 4 finish.
- B. All accessories, including dampers, installed in the duct system shall be constructed of stainless steel.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Ductwork, unless noted otherwise, shall be constructed for a positive pressure of 3" W.C. for supply ductwork and a negative pressure of 1.5" W.C. for exhaust and return ductwork. Ductwork reinforcement shall be provided as required by the SMACNA HVAC Duct Construction Standards - Metal & Flexible - Third Edition - 2005 for the pressure class and minimum gauges listed above. **Contractor shall submit a schedule indicating duct gauge and reinforcement methods to be utilized for each duct dimension range outlined above prior to fabricating any ductwork. Minimum metal thickness is listed in Para 2.4A above.** Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."
- M. Sizes of duct indicated as lined shall be adjusted to accommodate liner thickness maintaining interior dimensions.

3.2 SEAM AND JOINT SEALING

- A. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."
 - 1. For static-pressure classes 3 inch wg, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class B:

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.6 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as follows:
 - 1. Dishwasher Hood Exhaust Ducts:
 - a. Type 304, stainless-steel sheet.
 - b. Exposed to View: No. 4 finish.
 - c. Concealed: No. 2D finish.
 - d. Welded seams and flanged joints with watertight EPDM gaskets.
- B. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel.
 - 2. Stainless-Steel Ducts: Galvanized steel.
- C. Liner:
 - 1. Supply- and Return-Air Ducts: Fibrous glass, Type I, 1.5 inch thick.
 - 2. Transfer Ducts: Fibrous glass, Type I, 1.5 inch thick.
- D. Double-Wall Duct Interstitial Insulation:
 - 1. Supply- and Return-Air Ducts, 16 Inches and Smaller in Diameter or Rectangular Equivalent: 1 inch thick.
 - 2. Supply- and Return-Air Ducts, 18 Inches and Larger in Diameter or Rectangular Equivalent: 1 inch thick.
- E. Elbow Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

- 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vaness and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.
- F. Branch Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00

AIR DUCT ACCESSORIES

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. Backdraft and pressure relief dampers.
 - 2. Barometric relief dampers.
 - 3. Manual volume dampers.
 - 4. Control dampers.
 - 5. Fire dampers.
 - 6. Ceiling dampers.
 - 7. Smoke dampers.
 - 8. Combination fire and smoke dampers.
 - 9. Turning vanes.
 - 10. Duct-mounted access doors.
 - 11. Flexible connectors.
 - 12. Flexible ducts.
 - 13. Spin-ins.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
- B. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.

- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and exposed ducts.
- D. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Air Balance Inc.; a division of Mestek, Inc.
 - 2. American Warming and Ventilating; a division of Mestek, Inc.
 - 3. Cesco Products; a division of Mestek, Inc.
 - 4. Duro Dyne Inc.
 - 5. Greenheck Fan Corporation.
 - 6. Lloyd Industries, Inc.
 - 7. Nailor Industries Inc.
 - 8. NCA Manufacturing, Inc.
 - 9. Pottorff; a division of PCI Industries, Inc.
 - 10. Ruskin Company.
 - 11. SEMCO Incorporated.
 - 12. Vent Products Company, Inc.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2000 fpm.
- D. Maximum System Pressure: 2-inch wg.
- E. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:
 - 1. Material: Galvanized steel.
 - 2. Diameter: 0.20 inch.
- J. Tie Bars and Brackets: Aluminum or Galvanized steel.
- K. Return Spring: Adjustable tension.

- L. Bearings: Steel ball or synthetic pivot bushings.
- M. Sleeve: Minimum 20-gage thickness.

2.3 BAROMETRIC RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Air Balance Inc.; a division of Mestek, Inc.
 - 2. American Warming and Ventilating; a division of Mestek, Inc.
 - 3. Cesco Products; a division of Mestek, Inc.
 - 4. Duro Dyne Inc.
 - 5. Greenheck Fan Corporation.
 - 6. Lloyd Industries, Inc.
 - 7. Nailor Industries Inc.
 - 8. NCA Manufacturing, Inc.
 - 9. Pottorff; a division of PCI Industries, Inc.
 - 10. Ruskin Company.
 - 11. SEMCO Incorporated.
 - 12. Vent Products Company, Inc.
- B. Suitable for horizontal or vertical mounting.
- C. Maximum Air Velocity: 2000 fpm.
- D. Maximum System Pressure: 2-inch wg.
- E. Frame: 0.064-inch- thick, galvanized sheet steel, with welded corners and mounting flange.
- F. Blades:
 - 1. Multiple, 0.025-inch- thick, roll-formed aluminum.
 - 2. Maximum Width: 6 inches.
 - 3. Action: Parallel.
 - 4. Balance: Gravity.
 - 5. Eccentrically pivoted.
- G. Blade Seals: Neoprene.
- H. Blade Axles: Galvanized steel.
- I. Tie Bars and Brackets:
 - 1. Material: Aluminum or Galvanized steel.
 - 2. Rattle free with 90-degree stop.
- J. Return Spring: Adjustable tension.
- K. Bearings: Synthetic.
- L. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressures.

2.4 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.

- c. Flexmaster U.S.A., Inc.
 - d. McGill AirFlow LLC.
 - e. METALAIRE, Inc.
 - f. Nailor Industries Inc.
 - g. Pottorff; a division of PCI Industries, Inc.
 - h. Ruskin Company.
 - i. Trox USA Inc.
 - j. Vent Products Company, Inc.
 2. Standard leakage rating, with linkage outside airstream.
 3. Suitable for horizontal or vertical applications.
 4. Frames:
 - a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 6. Blade Axles: Galvanized steel.
 7. Bearings:
 - a. Oil-impregnated bronze or Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 8. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
1. Size: 1-inch diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include elevated platform for insulated duct mounting.
- D. Spin-in fittings:
1. Spin-in fittings shall be used for round take-offs from rectangular duct mains. Spin-ins shall include a scoop extractor and balancing damper with 2" stand-off bracket with locking quadrant and continuous square shaft with end bearings. Scoop shall be located so the balancing handle is located on the sides. The balancing damper handle shall not be located on the top of the spin during installation. See plan details.
- E. Use of "Dove-Tail" fittings or connections is prohibited.

2.5 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements:

1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Arrow United Industries; a division of Mestek, Inc.
 3. Cesco Products; a division of Mestek, Inc.
 4. Duro Dyne Inc.
 5. Flexmaster U.S.A., Inc.
 6. Greenheck Fan Corporation.
 7. Lloyd Industries, Inc.
 8. M&I Air Systems Engineering; Division of M&I Heat Transfer Products Ltd.
 9. McGill AirFlow LLC.
 10. METALAIRE, Inc.
 11. Metal Form Manufacturing, Inc.
 12. Nailor Industries Inc.
 13. NCA Manufacturing, Inc.
 14. Ruskin Company.
 15. Vent Products Company, Inc.
 16. Young Regulator Company.
- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Frames:
1. Hat shaped.
 2. Galvanized-steel channels, 0.064 inch thick.
 3. Mitered and welded corners.
- D. Blades:
1. Multiple blade with maximum blade width of 8 inches.
 2. Parallel- and opposed-blade design.
 3. Galvanized steel.
 4. 0.064 inch thick.
 5. Blade Edging: Closed-cell neoprene edging.
 6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- E. Blade Axles: 1/2-inch- diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F.
- F. Bearings:
1. Oil-impregnated bronze or Molded synthetic.
 2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 3. Thrust bearings at each end of every blade.

2.6 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements:
1. Air Balance Inc.; a division of Mestek, Inc.
 2. Arrow United Industries; a division of Mestek, Inc.
 3. Cesco Products; a division of Mestek, Inc.
 4. Greenheck Fan Corporation.
 5. McGill AirFlow LLC.
 6. METALAIRE, Inc.
 7. Nailor Industries Inc.
 8. NCA Manufacturing, Inc.
 9. PHL, Inc.
 10. Pottorff; a division of PCI Industries, Inc.

11. Prefco; Perfect Air Control, Inc.
 12. Ruskin Company.
 13. Vent Products Company, Inc.
 14. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Type: Static; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners. **Where fire dampers are serving stainless steel ductwork, the fire damper shall be constructed of stainless steel.**
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors. **Where fire dampers are serving stainless steel ductwork, the fire damper shall be constructed of stainless steel.**
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.7 SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements:
1. Air Balance Inc.; a division of Mestek, Inc.
 2. Arrow United Industries; a division of Mestek, Inc.
 3. Cesco Products; a division of Mestek, Inc.
 4. Greenheck Fan Corporation.
 5. METALAIRE, Inc.
 6. Nailor Industries Inc.
 7. Pottorff; a division of PCI Industries, Inc.
 8. Ruskin Company.
- B. General Requirements: Label according to UL 555S by an NRTL.
- C. Smoke Detector: Integral, factory wired for single-point connection.
- D. Frame: Hat-shaped, 0.094-inch thick, galvanized sheet steel, with overlapping gusseted or mechanically attached corners and mounting flange.
- E. Blades: Roll-formed, horizontal, interlocking, 0.063-inch thick, galvanized sheet steel.

- F. Leakage: Class II
- G. Rated pressure and velocity to exceed design airflow conditions.
- H. Mounting Sleeve: Factory-installed, 0.05-inch thick, galvanized sheet steel; length to suit wall or floor application.
- I. Damper Motors: two-position action.
- J. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 23 09 00 " INSTRUMENTATION AND CONTROL FOR HVAC "
 - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 - 6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
 - 7. Electrical Connection: [115 V, single phase, 60 Hz] <Insert values>.
- K. Accessories:
 - 1. Auxiliary switches for signaling and fan control.
 - 2. Momentary test switch, Test and reset switches

2.8 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Air Balance Inc.; a division of Mestek, Inc.
 - 2. Arrow United Industries; a division of Mestek, Inc.
 - 3. Cesco Products; a division of Mestek, Inc.
 - 4. Greenheck Fan Corporation.
 - 5. METALAIRE, Inc.
 - 6. Nailor Industries Inc.
 - 7. Pottorff; a division of PCI Industries, Inc.
 - 8. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Hat-shaped, 0.094-inch thick, galvanized sheet steel, with overlapping gusseted or mechanically attached corners and mounting flange.

- F. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.
- G. Smoke Detector: Integral, factory wired for single-point connection.
- H. Blades: Roll-formed, horizontal, interlocking, 0.063-inch thick, galvanized sheet steel.
- I. Leakage: Class II
- J. Rated pressure and velocity to exceed design airflow conditions.
- K. Mounting Sleeve: Factory-installed, 0.05-inch thick, galvanized sheet steel; length to suit wall or floor application.
- L. Master control panel for use in dynamic smoke-management systems.
- M. Damper Motors: two-position action.
- N. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 23 09 00 "INSTRUMENTATION AND CONTROL FOR HVAC."
 - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.

2.9 CEILING DAMPERS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Air Balance Inc.; a division of Mestek, Inc.
 - 2. Cesco Products; a division of Mestek, Inc.
 - 3. McGill AirFlow LLC.
 - 4. METALAIRE, Inc.
 - 5. Nailor Industries Inc.
 - 6. Prefco; Perfect Air Control, Inc.
 - 7. Ruskin Company.
 - 8. Vent Products Company, Inc.
 - 9. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. General Requirements:
 - 1. Labeled according to UL 555C by an NRTL.
 - 2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.

- D. Blades: Galvanized sheet steel with refractory insulation.
- E. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.
- F. Fire Rating: 2 hours.

2.10 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. METALAIRE, Inc.
 - 4. SEMCO Incorporated.
 - 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vaness and Vane Runners," and 2-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.11 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. American Warming and Ventilating; a division of Mestek, Inc.
 - 2. Cesco Products; a division of Mestek, Inc.
 - 3. Ductmate Industries, Inc.
 - 4. Flexmaster U.S.A., Inc.
 - 5. Greenheck Fan Corporation.
 - 6. McGill AirFlow LLC.
 - 7. Nailor Industries Inc.
 - 8. Pottorff; a division of PCI Industries, Inc.
 - 9. Ventfabrics, Inc.
 - 10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
 - 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.

- c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
- d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.12 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Ductmate Industries, Inc.
 - 2. Flame Gard, Inc.
 - 3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0428-inch stainless steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.13 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. Ventfabrics, Inc.
 - 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd. .
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.14 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Flexmaster U.S.A., Inc.
 2. McGill AirFlow LLC.
 3. Thermaflex
 4. Atco
- B. Insulated, Flexible Duct: UL 181, Class 1, CPE film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
 1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 175 deg F.
 - *4. Flexible duct insulation shall have a thermal resistance of R-6 or greater.**
- C. Flexible Duct Connectors:
 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action for sizes 3 through 18 inches, to suit duct size. **Nylon cable straps are not acceptable for securing flexible duct.**

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire and smoke dampers according to UL listing.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 1. On both sides of duct coils.
 2. Downstream from manual volume dampers, control dampers, turning vanes, and equipment.

3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 4. At each change in direction and at maximum 50-foot spacing.
 5. Upstream of turning vanes.
 6. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
1. One-Hand or Inspection Access: 8 by 5 inches.
- J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- M. Connect variable volume and powered induction terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- N. Connect diffusers or light troffer boots to low-pressure ducts directly or with maximum 72" lengths of flexible duct. Flexible ducts shall be supported at 36" intervals. Supports shall be attached to the structure and shall not crimp or impede proper airflow through the installed ductwork.
- O. Connect flexible ducts to metal ducts with stainless steel draw bands.
- P. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

END OF SECTION 23 33 00

SECTION 23 34 23

HVAC POWER VENTILATORS

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. This Section includes the following:
 1. Centrifugal roof ventilators.
 2. Ceiling-mounted ventilators.
 3. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on 1,000-foot elevation.
- B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 1. Certified fan performance curves with system operating conditions indicated.
 2. Certified fan sound-power ratings.
 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 4. Material thickness and finishes, including color charts.
 5. Dampers, including housings, linkages, and operators.
 6. Roof curbs.
 7. Fan speed controllers.
- B. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acme Engineering & Mfg. Corp.
 - 2. Aerovent; a Twin City Fan Company
 - 3. Breidert Air Products.
 - 4. Broan Mfg. Co., Inc.
 - 5. Delhi Industries Inc.
 - 6. Greenheck.
 - 7. Loren Cook Company.
 - 8. Penn Ventilation.
- B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
 - 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
 - 2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- E. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 - 3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
 - 4. All roof mounting curbs shall comply with requirements of architectural Division 07 the specifications. Curbs shall be a minimum 14 gauge and meet the requirements

of division 07 Roof Accessories. All roof curbs shall be approved by the Architect prior to placing order for construction.

2.2 CEILING-MOUNTED VENTILATORS

1. Acme Engineering & Mfg. Corp.
 2. Aerovent; a Twin City Fan Company
 3. Breidert Air Products.
 4. Broan Mfg. Co., Inc.
 5. Delhi Industries Inc.
 6. Greenheck.
 7. Loren Cook Company.
 8. Penn Ventilation.
- B. Housing: Steel, lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- D. Grille: Plastic grilles for fans from 50 to 200 cfm and painted aluminum grilles for fans greater than 200 cfm, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- F. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 2. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link. (As indicated on plans.)
 3. Isolation: Rubber-in-shear vibration isolators.

2.3 IN-LINE CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Acme Engineering & Mfg. Corp.
 2. Aerovent; a Twin City Fan Company
 3. Breidert Air Products.
 4. Broan Mfg. Co., Inc.
 5. Delhi Industries Inc.
 6. Greenheck.
 7. Loren Cook Company.
 8. Penn Ventilation.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

- F. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
 - 3. Companion Flanges: For inlet and outlet duct connections.
 - 4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
 - 5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.4 MOTORS

- A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- B. Enclosure Type: Totally enclosed, fan cooled.

2.5 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.
- C. Install units with clearances for service and maintenance.
- D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

3.4 WARRANTIES

- A. Fans shall be provided with 1 year warranty from substantial completion.

END OF SECTION 23 34 23

SECTION 23 3713

DIFFUSERS, REGISTERS, AND GRILLES

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. Rectangular and square ceiling diffusers.
 - 2. Louver face diffusers.
 - 3. Adjustable bar registers and grilles.
 - 4. Fixed face registers and grilles.
 - 5. Three hour fire rated square ceiling diffusers
 - 6. Three hour fire rated perforated ceiling return

- B. Related Sections:
 - 1. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 5. Duct access panels.
 - 6. Coordinate frame types with architectural reflected ceiling plans.

- C. Source quality-control reports.

- D. The reflected ceiling plan shall be referenced to determine air device frame types. Air devices located in gypsum board ceilings shall be installed with steel surface mount adaptor frame.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
 2. Devices shall be specifically designed for variable-air-volume flows.
 3. Material: Steel or Aluminum.
 4. Finish: Baked enamel, white.
 5. Face Size: Per schedule and ceiling type.
 6. Mounting: Per schedule and ceiling type.
 7. Pattern: Fixed.
 8. Dampers: Radial opposed blade.
 9. Accessories:
 - a. Equalizing grid.
 - b. Plaster ring.
 - c. Safety chain.
 - d. Wire guard.
 - e. Sectorizing baffles.
 - f. Operating rod extension.
 10. Fire Rated: Diffusers noted with FR in the schedule shall be provided with a fire damper. Units must be UL classified fire rated ceiling diffuser assemblies listed in Underwriters Laboratories Fire Resistance Directory. Diffusers shall be tested in accordance with UL 263 and must meet NFPA 90A requirements. Diffusers must be able to operate in three-hour fire rated, exposed grid, suspended ceilings and must be installed in accordance with the installation instructions. These diffusers shall consist of an outer frame assembly of the sizes and mounting type shown on the plans and outlet schedule. A square inlet shall be an integral part of the frame assembly. An inner core assembly consisting of fixed deflection louvers shall be available in 1-, 2-, 3- or 4-way horizontal discharge patterns. The inner core assembly must be removable in the field without tools for easy installation, cleaning or damper adjustment.
- B. Louver Face Diffuser:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
 2. Devices shall be specifically designed for variable-air-volume flows.
 3. Material: Steel or Aluminum.
 4. Finish: Baked enamel, white.
 5. Face Size: Per schedule and ceiling type.
 6. Mounting: Per schedule and ceiling type.
 7. Pattern: Four-way, unless noted otherwise.
 8. Dampers: Radial opposed blade.
 9. Accessories:
 - a. Square to round neck adaptor.
 - b. Adjustable pattern vanes.
 - c. Throw reducing vanes.
 - d. Equalizing grid.
 - e. Plaster ring.

- f. Safety chain.
 - g. Wire guard.
 - h. Sectorizing baffles.
 - i. Operating rod extension.
10. Three Hour Fire Rated: Diffusers noted with FR in the schedule shall be provided with a fire damper. Units must be UL classified fire rated ceiling diffuser assemblies listed in Underwriters Laboratories Fire Resistance Directory. Diffusers shall be tested in accordance with UL 263 and must meet NFPA 90A requirements. Diffusers must be able to operate in three-hour fire rated, exposed grid, suspended ceilings and must be installed in accordance with the installation instructions. These diffusers shall consist of an outer frame assembly of the sizes and mounting type shown on the plans and outlet schedule. A square inlet shall be an integral part of the frame assembly. An inner core assembly consisting of fixed deflection louvers shall be available in 1-, 2-, 3- or 4-way horizontal discharge patterns. The inner core assembly must be removable in the field without tools for easy installation, cleaning or damper adjustment.

2.2 REGISTERS AND GRILLES

- A. Adjustable Bar Register:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
 - 2. Material: Steel or Aluminum.
 - 3. Finish: Baked enamel, white.
 - 4. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
 - 5. Core Construction: Integral.
 - 6. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
 - 7. Frame: 1-1/4 inches wide.
 - 8. Mounting Frame: Per schedule and ceiling type.
 - 9. Mounting: Per schedule and ceiling type.
 - 10. Damper Type: Adjustable opposed blade.
- B. Adjustable Bar Grille:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
 - 2. Material: Steel or Aluminum.
 - 3. Finish: Baked enamel, white.
 - 4. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
 - 5. Core Construction: Integral.
 - 6. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
 - 7. Frame: 1-1/4 inches wide.
 - 8. Mounting Frame: Per schedule and ceiling type.
 - 9. Mounting: Per schedule and ceiling type.
- C. Fixed Face Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Nailor Industries Inc.
 - c. Price Industries.
 - d. Titus.
 2. Material: Steel or Aluminum.
 3. Finish: Baked enamel, white.
 4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
 5. Core Construction: Integral.
 6. Frame: 1-1/4 inches wide.
 7. Mounting Frame: Per schedule and ceiling type.
 8. Mounting: Per schedule and ceiling type.
 9. Damper Type: Adjustable opposed blade.
- D. Fixed Face Grille:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Nailor Industries Inc.
 - c. Price Industries.
 - d. Titus.
 2. Material: Steel or Aluminum.
 3. Finish: Baked enamel, white.
 4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
 5. Core Construction: Integral.
 6. Frame: 1-1/4 inches wide.
 7. Mounting Frame: Per schedule and ceiling type.
 8. Mounting: Per schedule and ceiling type.
- E. Three Hour Perforated Return Grille, Flush Face:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Nailor Industries Inc.
 - c. Price Industries.
 - d. Titus.
 2. Material: Steel or Aluminum.
 3. Finish: Baked enamel, white.
 4. Face Arrangement: Perforated.
 5. Core Construction: Integral.
 6. Frame: 1-1/4 inches wide.
 7. Mounting Frame: Per schedule and ceiling type.
 8. Mounting: Per schedule and ceiling type.
 9. Returns noted with FR in the schedule shall be provided with a fire damper.
 10. Perforated ceiling return shall be steel, flush face for return. The return model shall have the same face and border construction as the supply model for harmonious appearance in the room. Units must be UL classified fire rated ceiling diffuser assemblies listed in Underwriters Laboratories Fire Resistance Directory. Diffusers shall be tested in accordance with UL 263 and must meet NFPA 90A requirements. Diffusers must be able to operate in three-hour fire rated, exposed grid, suspended ceilings and must be installed in accordance with the installation instructions.
 11. Returns shall have a perforated face with 3/16-inch diameter holes on 1/4-inch staggered centers and no less than 51 percent free area. Perforated face shall be steel. The backpan shall be one-piece-stamped heavy gauge steel of the

sizes and mounting types shown on the plans and outlet schedule. Thermal protection blanket shall not contain asbestos.

2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 23 41 00

PARTICULATE AIR FILTRATION

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 factory-fabricated air-filter devices and media used to remove particulate matter from air for HVAC applications.
- B. The Contractor shall be responsible for coordinating filter installation with HVAC equipment installation. Note: No HVAC equipment shall be operated without a filter installed.

1.3 SUBMITTALS

- A. Product Data: Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.
- B. Operation and Maintenance Data: For each type of filter and rack to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air filters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Comply with ARI 850.
- C. Comply with ASHRAE 52.1 and ASHRAE 52.2 for method of testing and rating air-filter units.
- D. Comply with NFPA 90A and NFPA 90B.

PART 2 - PRODUCTS

2.1 REPLACEABLE MEDIA PANEL FILTERS

- A. Description: Factory-fabricated, replaceable media filters with holding frames.
- B. Media: Fibrous material with anti-microbial agent and held in place by self-supporting wire grid of the frame below. Minimum rating MERV-8.
- C. Media-Grid Frame: Steel frames with hardware cloth grid in accordance with Owner's filter service standards.

- D. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners, and suitable for bolting together into built-up filter banks.

2.2 SIDE-SERVICE HOUSINGS

- A. Description: Factory-assembled, side-service housings, constructed of galvanized steel, with flanges to connect to duct system.
- B. Access Doors: Continuous gaskets on perimeter and positive-locking devices. Arrange so filter cartridges can be loaded from either access door.
- C. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames to prevent bypass of unfiltered air.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The contractor shall maintain filters during construction as noted in this section. The filters shall be replaced monthly or sooner depending on jobsite conditions and the amount of airborne debris. The owner or engineer can require the filters to be replaced more often depending on jobsite conditions.
- B. Install filter frames according to manufacturer's written instructions.
- C. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.
- D. Install filters in position to prevent passage of unfiltered air.
- E. Coordinate filter installations with duct and air-handling unit installations.

3.2 CLEANING

- A. After completing system installation and testing, adjusting, and balancing air-handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION 23 41 00

SECTION 23 43 10

BI-POLAR IONIZATION UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section describes the design, performance and installation of an air purification system intended for use as part of another manufacturer's air handling unit, including, but not limited to fan-coils and other air handling equipment as shown on the plans, details or equipment schedules.

1.03 RELATED WORK

- A. Testing, balancing and inspection services
- B. Facility Access and Protection
- C. Duct work
- D. Electrical Wiring
- E. Control Wiring

1.04 SUBMITTALS

- A. Product Data: Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.
- B. Third party verified test data showing that the system submitted complies with ASHRAE Standard 62.1-2019 requirements for the indoor air quality procedure. Also, computer selections of each application where the equipment is used (Classrooms, Offices, Cafeterias, etc.) shall be submitted.
- C. Product performance data for filters, gauges and housings.
- D. Product drawings detailing all physical, electrical, ductwork and control requirements.
- E. Manufacturer's Follow-up Service Program details.

1.05 REFERENCE TO CODES AND STANDARDS

- A. ASHRAE Standards 62 & 52 including ASHRAE 62.1-2019 Section 5.7.1
- B. UL Standard 867
- C. UL 2998 – Ozone Free Certification
- D. National Electric Code NFPA 70, 1990

1.06 QUALITY ASSURANCE

- A. The Air Purification System shall be a product of an established manufacturer with installations in successful operation in the USA. Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters shall not be considered.
- B. A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system to ensure installation in accordance with manufacturer's recommendation.
- C. The air purification manufacturer shall be listed by either UL or Intertek/ETL for conformance to UL 867-2007 and UL 2998, proving there is no ozone produced.
- D. Provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.2- 2019 to validate acceptable indoor air quality at the quantity of outside air scheduled.

1.07 WARRANTY

- A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of twelve months after shipment or eighteen months for Owner acceptance, whichever occurs first.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver in factory fabricated shipping containers. Identify on outside of container the type of product and location where it is to be installed. Do not crush or bent product or container.
- B. Store in original cartons and protect from weather and construction work traffic.
- C. Store indoors and in accordance with the manufacturer's recommendations for storage.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Equals are, as follows below, provided they meet all requirements of this specification. The contractor shall be responsible for any additional costs associated with

substitution from the basis of design. All other alternate manufacturers submitted for substitution must provide their ASHRAE 62.1 calculations that prove conformance to the ASHRAE Standard with the reduction of outside air to the scheduled values. A letter on the manufacturer's letterhead requesting prior approval must accompany the request for prior approval stating their calculations are ASHRAE compliant and an independent validation study has been performed to validate the accuracy of the ASHRAE modeling software. Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Plasma-Air
2. Global Plasma Solutions
3. Or Approved Equal

2.02 DESCRIPTION

- A. Each piece of air handling equipment, so designated on the plans, details and/or equipment schedules shall contain a needlepoint bi-polar ionization generator capable of:
 1. Effectively killing microorganisms throughout cooling coil, drain pan and supply duct (mold, bacteria, virus, etc.).
 2. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
 3. Capable of reducing static space charges.
- B. Air Exchange Rate
 1. Air exchange rates may vary through the full operating range of a constant volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.
- C. Velocity Profile
 1. The needlepoint bi-polar ionization system shall operate under any velocity.
- D. Humidity
 1. Needlepoint ionization system shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 99% shall not cause damage, deterioration or dangerous conditions within the air purification system.

2.03 EQUIPMENT REQUIREMENTS

- A. Electrode Specifications
 1. Each needlepoint bi-polar ionization unit shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Electrodes shall be installed in pairs to create the required dielectric. Electrodes shall be constructed of fiber brushes. Metal based electrodes are not acceptable.
- B. Unit Casing Mounted Units
 1. Where so indicated on the plans and/or schedules, ionization unit(s) shall be supplied and installed. The ion generator shall be installed inside the air handling units to the fan inlet by use of rare earth magnets. Filtration on any equipment requiring bi-polar ionization shall be MERV 6 or better.
 - a. Ion generators shall have ionization status indication lights, auto-reset circuit breaker, external alarm connector, and universal voltage input with a range of 24VAC to 240VAC or DC, which allows for any voltage fluctuations and the carbon fiber electrode shall not vary more than 1% during the entire operating range of voltage.

- b. Each unit shall be UL listed.
- c. Units requiring maintenance and replacement parts shall not be acceptable.

2.04 IONIZATION REQUIREMENTS

- A. Bi-Polar Ionization Generator(s)
 - 1. Bi-polar ionization generator(s), capable of controlling gas phase contaminants, shall be provided for all equipment.
 - 2. The needlepoint bi-polar ionization system shall consist of carbon fiber electrodes, power generators.
 - 3. Provide binary "dry" alarm contacts for connection to the BAS.
 - 4. The self contained generators shall be located inside each air handler, for ease of mounting and review during filter changes.
 - 5. Units shall be powered from the associated air handlers control power. Ion generators shall accept AC or DC voltage from 24V to 240V without field modifications or supplemental power supplies.
 - 6. Each ion generator shall produce a minimum of 400 million ions/cc as measured 1" from the electrode, up to 4,800 CFM of airflow. Higher airflows shall have additional ionization units.
- B. The operation of the needlepoint bi-polar ionization units shall conform to ASHRAE Standard 62.1, UL 867, UL 2998 and CE.
- C. Dielectric Barrier Discharge and Corona Discharge tube systems made from glass, ceramic, mica or composite materials shall not be acceptable due to ozone output and the need for replacement parts.

2.05 ELECTRICAL REQUIREMENTS

- A. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Units shall be provided at the voltage and phase available. Electrical service shall be coordinated with the mechanical contractor and electrical contractor prior to ordering equipment. Ion generators shall be designed such that line voltage that varies 10% or greater from nominal or when electrical spikes or transients are present shall not require additional power conditioning and the high voltage output shall not change more than 1% from 24V to 240V.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. The units shall be installed in accordance with the manufacturer's instructions.
- B. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and consulting engineer.
- C. Any material damaged by handling, water or moisture shall be replaced, by the mechanical contractor, at no cost to the owner.

- D. All equipment shall be protected from dust and damage on a daily basis throughout construction.
- E. Clean all components prior to commissioning.

3.02 TESTING

- A. Provide the manufacturers recommended electrical and static pressure tests.

3.03 COMMISSIONING & TRAINING

- A. A manufacturer's authorized representative shall provide start-up supervision and training of owner's personnel in the proper operation and maintenance of all equipment.
- B. Provide 5 copies of Operating and Maintenance Manuals.
- C. Warranty and Service
 - 1. A manufacturer's authorized service representative shall provide service support to insure satisfactory air purification system operation. The units shall have a minimum 2-year parts and labor warranty.

3.04 CLEANING

- A. After completing system installation and testing, adjusting, and balancing air-handling and air-distribution systems and at accepted substantial completion, clean filter housings and install new filter media.

END OF SECTION 23 43 10

**SECTION 23 55 43
WALL AND CEILING HEATERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes wall and ceiling heaters with propeller fans and electric heating elements.

1.03 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Plans, elevations, sections, and details.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Operation and Maintenance Data: For wall and ceiling heaters to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Raywall.
 - 2. Markel Products.
 - 3. Q'Mark Electric Heating.

2.02 ELECTRIC CEILING MOUNTED HEATERS

- A. Provide heavy duty, ceiling mounted, forced air heater of the voltage as specified under the electrical division of work. Units shall be installed and wired in accordance with the manufacturer's recommendations and applicable national and local codes.
- B. Heater shall be lay-in ceiling design mounted in the horizontal position. Unit shall contain vertical down discharge designed to supply heated air at the floor with unit mounted at 10'-0" above floor.
- C. Fan motor shall be permanently lubricated, totally enclosed, shaded pole type with impedance protection. A protective shield shall surround the motor to separate return air from the supply air.
- D. Heating element assemblies shall consist of two or three corrosion resistant steel sheathed elements, mechanically bonded to common corrosion resistant steel fins. Elements shall be helically coiled nickel chromium alloy resistance wire completely embedded in and surrounded by magnesium oxide, enclosed and swaged into corrosion resistant steel sheaths. Elements shall have no more than 60 watts per inch.
- E. Heaters shall be equipped with a zero-voltage reset thermal overload, which disconnects the motor and elements should normal operating temperatures be exceeded. Provide with manual reset.
- F. Provide wall mounted, heavy duty, tamper proof, low voltage thermostat.
- G. Units shall be U.L. listed with integral disconnect switch.

2.03 ELECTRIC WALL HEATERS

- A. Provide heavy duty, wall mounted, forced air heater of the voltage as specified under the electrical division of work. Units shall be installed and wired in accordance with the manufacturer's recommendations and applicable national and local codes.
- B. Heater shall be wall mounted in the vertical. Unit shall contain vertical down discharge designed to supply heated air at the floor.
- C. Fan motor shall be permanently lubricated, totally enclosed, shaded pole type with impedance protection. A protective shield shall surround the motor to separate return air from the supply air.
- D. Heating element assemblies shall consist of two or three corrosion resistant steel sheathed elements, mechanically bonded to common corrosion resistant steel fins. Elements shall be helically coiled nickel chromium alloy resistance wire completely embedded in and surrounded by magnesium oxide, enclosed and swaged into corrosion resistant steel sheaths. Elements shall have no more than 60 watts per inch.
- E. Heaters shall be equipped with a zero-voltage reset thermal overload, which disconnects the motor and elements should normal operating temperatures be exceeded. Provide with manual reset.

- F. Provide with integral, tamper proof, low voltage thermostat.
- G. Units shall be U.L. listed with integral disconnect switch, and be manufactured by Markel, Raywall, or Berko.

2.04 UNIT HEATERS

- A. Units shall consist of an outer casing containing electric heating elements, fan, fan guard, horizontal adjustable discharge louver and operating controls.
- B. Units shall be designed and certified by Underwriters Laboratory (U.L.) or ETL.
- C. Unit heater shall be equipped with high limit switch, integral T-stat, and four-point connection.
- D. Manufacturers shall be Chromalox, Markel, Berko, Trane, Modine, Reznor, Raywall, or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive wall and ceiling heaters for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for electrical connections to verify actual locations before wall and ceiling heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install wall boxes in finished wall assembly.
- B. Install wall and ceiling heaters to comply with NFPA 90A.
- C. Suspend wall and ceiling heaters from structure with threaded rod.

3.03 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.04 ADJUSTING

- A. Adjust initial temperature set points.

END OF SECTION 23 55 43

SECTION 23 81 27

SPLIT SYSTEM AIR CONDITIONER

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. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting and may be connected to ducts.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- C. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2010, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. ASHRAE/IESNA 90.1-2007 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.5 COORDINATION

- A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

1.6 WARRANTY

- A. The system shall be provided with a minimum 2 years parts and labor warranty.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Compressor - Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Daikin
 - 2. Trane
 - 3. Carrier Air Conditioning

2.2 FAN-COIL UNITS

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 - 1. Insulation: Faced, glass-fiber duct liner.
 - 2. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1-2010.
 - 3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010.
- B. Provide a variable speed evaporator blower with motor and matching cooling coil. Evaporator blower motor shall be ECM type.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- D. Heating Section: Electric Heat: Corrosion resistant steel sheathed elements mechanically bonded to corrosion resistant steel fins. Elements shall be helically coiled nickel chromium alloy resistance wire embedded in and surrounded by magnesium oxide.
- E. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

- F. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - 1. Special Motor Features: Multi-tapped, multispeed with internal thermal protection and permanent lubrication.
- G. Disposable Filters: 2 inch thick, in fiberboard frames with ASHRAE 52.2 MERV rating of 8 or higher.
- H. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

- A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - 1. Compressor Type: Scroll.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid sub-cooler.
- D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.
- E. Fan: Aluminum-propeller type, directly connected to motor.
- F. Motor: Permanently lubricated, with integral thermal-overload protection.
- G. Low Ambient Kit: Permits operation down to 45 deg F.
- H. Mounting Base: Polyethylene.
- I. Refrigerant: R-134a
- J. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2010, "Energy Standard for Buildings except Low-Rise Residential Buildings."

2.4 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."
- B. Automatic-reset timer to prevent rapid cycling of compressor.
- C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.
- D. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- E. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.
- F. Unit shall be provided with electro-mechanical controls (24-volt terminal strip) for control by a programmable thermostat.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."
- D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- E. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 81 27

- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.
- D. Manufacturers:
 - 1. Charlotte Pipe
 - 2. Tyler Pipe
 - 3. AB&I

2.04 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888, for above grade sanitary waste and vent. All pipe and fittings shall be marked with the collective trademark of the Cast iron Soil Pipe Institute (CISPI) and be listed by NSF.
 - 1. Manufacturers:
 - a. Charlotte Pipe
 - b. Tyler Pipe
 - c. AB&I
- B. Shielded Couplings: ASTM 1540 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
 - a. Manufacturers:
 - 1) Clamp-All Corp. - Model 80
 - 2) Ideal Div.; Stant Corp. – Heavy Weight
 - 3) Husky – SD-2000
 - 4) Tyler Pipe; Soil Pipe Div.

2.05 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Series PS 100 sewer and drain pipe.
 - a. Manufacturers:
 - 1) Charlotte Pipe & Foundry Co.
 - 2) Sanderson
 - 3) Lasco
 - 4) Tigre

2.06 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
 - a. Manufacturers:
 - 1) Cambridge Lee
 - 2) Howell Metal
 - 3) Cerro Flow Products

PART 3 - EXECUTION

3.01 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfilling for work included in Division 22 of the specifications.

3.02 EXCAVATION

- A. Excavations shall be performed in strict accordance with latest OSHA regulations. Sheeting, bracing, barricades and fencing shall be installed wherever necessary to avoid undue hazards to workmen or passersby.
- B. During excavation, material shall be piled at a distance from the banks of the excavation that will avoid overloading and will prevent slides and/or cave-ins. Water accumulating in excavations shall be removed by pumping. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled under sidewalks and curbs where pipe can be installed as specified and back-fill can be tamped. All trenches and pit excavations shall be shored and/or braced as required to prevent slides and/or cave-ins.
- C. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and the making of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded. Over-depths shall be backfilled as specified and with materials for backfilling as specified.

3.03 BACKFILLING

- A. The trenches shall not be backfilled until all required pressure and/or leak tests on piping are performed and until the mechanical systems as installed conform to requirements specified in the several sections covering the installation of the various systems. Trenches shall be backfilled to the ground surface with clean, selected excavated material or other material that meets compaction requirements and as hereinafter specified. Pavement and base course disturbed by trenching operation shall be restored to its original condition.
- B. Backfill material shall be deposited in 6-inch thick layers and compacted with mechanical tamps to the density of the adjacent soil or grade until there is a cover of not less than 2 feet over pipes. The backfill material in this portion of the trench shall consist of earth, sandy clay, soft shale, or other materials free from objects larger than 1 inch in any direction.
- C. The remainder of the trench shall be backfilled with clean, select material that is free of stones larger than 3 inches in any direction. Backfill material shall be deposited in layers not exceeding 6 inches thick, and each layer shall be compacted mechanically. Settling of granular, non-cohesive material with water will be permitted. The surface shall be mounded over for settling and left in a uniform condition.

3.04 COMPACTION AND TESTING

- A. Areas under building locations, paving, walks or other structures which may be placed on site at a future date shall be compacted to 95% minimum dry proctor.

3.05 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground, soil and waste piping 10" and smaller shall be the following:
 - 1. Hubless cast-iron soil pipe and fittings heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
 - 2. Copper DWV tube, copper drainage fittings, and soldered joints.
- C. Aboveground, sanitary vent piping 6" and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings; heavy-duty shielded, stainless-steel couplings; and hubless-coupling joints.
- D. Underground, soil, waste, and vent piping 6" and smaller shall be the following:
1. Schedule 40, solid wall, PVC piping, solvent socket weld DWV fittings.

3.06 PIPING INSTALLATION

- A. Sanitary sewer piping outside the building is specified in Division 2 Section "Sanitary Sewerage."
- B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- C. Install seismic restraints on piping where called for on plans or as required by Code for Site Classification listed. Seismic-restraint devices are specified in Division 23 Section "Mechanical Vibration Control."
- D. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- E. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
1. Building Sanitary Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller or 2 percent where called for on plans; 1 percent downward in direction of flow for piping NPS 4 and larger.
 2. Horizontal Sanitary Drainage Piping: 1 percent downward in direction of flow or 2 percent where called for on plans.
 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- I. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- K. Hub and spigot piping connections shall not be used above slab on grade.

- L. No horizontal piping shall be installed in the slab.

3.07 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- C. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
- D. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
- E. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.08 HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Division 23 Section "Mechanical Vibration Control."
- B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Install individual, straight, horizontal piping runs according to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer than 100 feet: MSS Type 43, adjustable roller hangers.
 - c. Longer than 100 feet, if indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment".
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

- I. Install supports for vertical copper tubing every 10 feet.
- J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.09 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.10 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 48 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Water test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

- 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 6. Prepare reports for tests and required corrective action.
- E. Video camera testing shall be performed on sanitary waste and vent systems. Refer to section 22 70 00 "Plumbing Systems Testing" requirements, procedures and reporting.

3.11 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 13 16 (EXCEPT FOR THE ATTACHED SCHEDULE)

SCHEDULE OF PIPING MATERIALS AND TESTS

SERVICE	SYMBOL	TEST	TEST
		PRESSURE	DURATION
Sanitary Waste Drain (below grade)	W	10' static HD	1 Hr.
Sanitary Soil Drain (below grade)	S	10'static HD	1 Hr.
Sanitary Vent (below grade)	V	10' static HD	1 Hr.
Sanitary Waste Drain (above slab)	W	10' static HD	1 Hr.
Sanitary Soil Drain (above slab)	S	10'static HD	1 Hr.
Sanitary Vent (above slab)	V	10' static HD	1 Hr.
Trap Primer Tubing	TP	Available Head	30 Min.
Condensate Drains	CD	5' Head	2 Hrs.



APPENDIX A

ATLAS

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION

Cobb Parks Maintenance Building

Marietta, Georgia

Atlas Project No. 2349

PREPARED FOR:

Cobb County Parks

1792 County Services Parkway

Marietta, Georgia 30008

PREPARED BY:

Atlas Technical Consultants, LLC

3000 Northfield Place, Suite 1100

Roswell, Georgia 30076

November 21, 2022



November 21, 2022

Ms. Barbara Savage
Cobb County Parks
1792 County Services Parkway
Marietta, Georgia 30008

**Subject: Report of Subsurface Exploration and
Geotechnical Engineering Evaluation
Cobb Parks Maintenance Building**
County Services Parkway
Marietta, Georgia

Dear Barbara:

Atlas Technical Consultants, LLC (Atlas) is pleased to provide this report of our subsurface exploration and geotechnical engineering evaluation for the referenced project. The field study and this report were accomplished in general accordance with Atlas Proposal No. 22-12073, dated September 21, 2022.

The following report will present a summary of our pertinent findings and recommendations followed by our understanding of the proposed construction, methods of exploration employed, site and subsurface conditions encountered, and conclusions and recommendations regarding the geotechnical aspects of the project. Should you have any question regarding items discussed in this report, please do not hesitate to contact the undersigned.

Sincerely,
Atlas Technical Consultants, LLC



Carlos Brito
Staff Engineer



Jonathan P. Sharpe, P.E.
Senior Registered Engineer



CB/JPS/ew
Attachments

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APPENDIX

Soil Test Boring Procedures
Correlation with Standard Penetration Test Results
Figure 1: Site and Boring Location Plan
Soil Classification Chart
Soil Boring Records (4)



1.0 SUMMARY

The following is a summary of our pertinent findings and recommendations. The reader is referred to the remaining text of this report for elaboration on these items.

1. The property appears generally suitable for the proposed construction, from a geotechnical standpoint.
2. General subsurface conditions consist of a surficial layer of topsoil underlain by moderate consistency residual soils. Boring B-3 encountered partially weathered rock beginning at a depth of 13 feet. No other borings encountered rock or partially weathered rock to the depths drilled.
3. The structures may be supported by conventional shallow foundations, bearing on existing residual soil or new structural fill, using a net allowable bearing pressure of 3,000 psf.
4. The on-site soils are visually suitable for reuse as structural fill.
5. Excavations to the depths explored at our boring locations can be accomplished using conventional heavy earthmoving equipment. If excavations in the vicinity of boring B-3 are planned to be deeper than 13 or so feet, partially weathered rock may be encountered, and difficult excavation techniques required to facilitate further excavation.

2.0 PROPOSED CONSTRUCTION

We understand Cobb County PARKS is planning the construction of a new 6,000 SF maintenance building. From the plans provided the structure will be steel framed and supported on slab-on-grade and shallow foundations. No grading plan has been provided at this time, but we have assumed that the proposed structure will be built essentially at the existing grade and minimal cuts or fill will be required to achieve design subgrade elevations.

No other details of the proposed construction were available at the time this proposal was prepared.

3.0 METHODS OF EXPLORATION

To evaluate the subsurface conditions, the property was explored by a combination of a visual site reconnaissance and drilling four (4) soil test borings to depths of 20 feet below the existing grades. The borings were located in the field by measuring distances and estimating directions from identifiable site features. Therefore, their locations as shown on the Site and Boring Location Plan in the Appendix should be considered approximate.

The borings were advanced by twisting continuous hollow stem auger flights into the ground. At selected intervals, Standard Penetration Resistance Testing (SPT) was performed in general accordance with ASTM Standard D-1586, and soil samples were collected for visual classification. The results of the penetration tests, when properly evaluated, provide an indication of the relative consistency of the soil being sampled, the potential for difficult excavation, and the soil's ability to support loads. A more detailed description of the drilling and sampling process is included in the Appendix of this report.



Soil samples recovered during the drilling process were returned to the office where they were classified in general accordance with the Unified Soil Classification System (USCS). Detailed descriptions of the materials encountered at each boring location, along with a graphical representation of the Standard Penetration Test results, are shown on the Soil Boring Records in the Appendix.

4.0 SITE DESCRIPTION, GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Site Description

The subject property is located southwest of the Cobb County Parks Recreation and Cultural Affairs Department Building. The south side of the site is generally bordered by the County Farm Lake, the north side is bordered by a residential development, and the west side is bordered by a wooded area and what appears to be a service entrance. Topographically the site has a gentle downward slope from the northeast to the southwest.

4.2 Geology

The site is located in the Piedmont Physiographic Province of Georgia. The residual soils in the Piedmont are the result of the chemical and physical weathering of the underlying parent rock. The weathering profile usually results in fine grained clayey silts and silty clays near the surface, where weathering is more advanced. With depth, sandy silts and silty sands are found, often containing mica. Below the residual soils, partially weathered rock is often found as a transition above relatively unweathered rock. In local practice, partially weathered rock is arbitrarily defined as residual soils with Standard Penetration Resistances in excess of 100 blows per foot (50 blows per 6 inches), and which can be penetrated by a power auger.

4.3 Subsurface Conditions

4.3.1 Topsoil

All borings initially encountered 2 to 4 inches of topsoil and associated root zone.

4.3.2 Residuum

Residuum, formed by in-place weathering of the parent rock, was encountered immediately below the topsoil in all borings. The residuum was classified as sandy silts (ML), silty clays (CL), and silty sands (SM) and was of moderate consistency. Standard Penetration Test results ranged from 8 to 29 blows per foot, with 11 to 18 bpf being typical.



4.3.3 Partially Weathered Rock

Partially weathered rock (PWR) is a transitional material between soil and rock, which retains the relic structure of the rock and has very hard or very dense consistencies. Partially weathered rock was encountered at a depth of 13 feet in boring B-3 and continued to the boring termination depth of 20 feet. The PWR was classified as very dense silty sands with SPT results of 50 blows per 5 to 6 inches of sampler penetration.

4.3.4 Groundwater

No groundwater was encountered to the depths drilled. Groundwater fluctuations of 5 feet or more are common in this geology.

The conditions described in the preceding paragraphs, and those shown in the Appendix, have been based on interpolation of the results of the previously described data using generally accepted principles and practices of geotechnical engineering. However, conditions in this geology may vary intermediate of the tested locations.

Although individual soil test borings are representative of the subsurface conditions at the precise boring locations on the day drilled, they are not necessarily indicative of the subsurface conditions at other locations or other times. The nature and extent of variation between the borings may not become evident until the course of construction. If such variations are then noted, it will be necessary to reevaluate the recommendations of this report after on-site observation of the conditions.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the data gathered during this exploration, our understanding of the proposed construction, our experience with similar site and subsurface conditions and generally accepted principles and practices of geotechnical engineering. Should the proposed construction change significantly from that described in this report, we request that we be advised so that we may amend these recommendations accordingly. This report and the conclusions and recommendations provided herein are provided exclusively for the use of Cobb County Parks and are intended solely for design of the referenced project.

5.1 Site Preparation

As an initial step in site preparation, all trees and unwanted vegetation should be removed, stumps grubbed, and organic topsoil stripped.

As is typical with flat, pre-graded/previously developed sites, that have poor drainage and that have been left idle for several years, loose surface conditions in the top 12 to 18 inches likely exist due to effects of freezing and thawing, and/or other man-made disturbance. We therefore recommend that a geotechnical engineer observe proofrolling with a fully loaded tandem axle dump truck (20 tons) of any surface soils that are to

remain in place so that soil consistency can be evaluated to determine if reconditioning is warranted. If reconditioning is warranted, the "disturbed" soil will need to be scarified, moisture conditioned and then compacted to project specifications.

All areas to receive fill should be evaluated prior to fill placement. The approval process should include proofrolling the subgrade with a fully loaded tandem axle dump truck (20 tons) during a period of dry weather and under the observation of the geotechnical engineer. Any areas which "pump" or "rut" excessively under the weight of the proofrolling vehicle should be further evaluated and may require undercutting or other remediation. The proofrolling can occasionally detect pits where stumps or other debris may have been buried, or other areas where weak surface conditions exist.

5.2 Earthwork

The residual soils on the property visually appear suitable for reuse as structural fill. Moisture control may be necessary.

It is our opinion that the on-site soils are generally suitable for use as structural fill. However, use of Piedmont Geology residual soils as backfill may not be accepted by all designers of mechanically stabilized earth walls (modular block walls) if any are proposed for this site. While these soils generally meet weight and strength characteristics used by most retaining wall designers for soil backfill, they may not meet the gradation criteria for all wall designers. One nationally accepted retaining wall design standard does not permit use of soil as backfill which have more than 35% of their volume classified as clays or silts. There are local wall designers who recognize the difficulty of meeting that gradation criterion in the Piedmont Geology and who are willing to accommodate these soil types in their design. Without knowledge of which retaining wall designer may be selected for the project we can only advise you that some local designers will severely restrict "their definition" of suitable soils for retaining wall backfill. In those cases, the on-site soils may not be judged suitable by them for their purpose. As such, we recommend the retaining wall contractor discuss their ability to utilize the on-site soils as described on the boring records in the Appendix of this report prior to their selection.

Where fill is placed against slopes steeper than 5H:1V, it will be necessary to "bench" the new fill into the existing soils to insure an adequate bonding of the fill with the existing material. Inadequate benching may create a predefined plane of weakness and adversely affect slope stability.

All structural fills should be compacted to at least 95 percent of the soil's standard Proctor maximum dry density, as determined by ASTM Standard D-698. The upper foot of fill which will support pavements or slabs should be compacted to at least 98 percent of the soil's standard Proctor maximum dry density for improved support. In areas which are at or above the finished grade, and which will support pavements or slabs, the upper 8 inches immediately below these systems should be scarified and recompact to the 98 percent criteria. Structural fill should be free of organic material, have a plasticity index (PI) less than 20 and contain rock sizes no larger than 4 inches.

Density testing should be performed by a soils technician to determine the degree of compaction and verify compliance with the project specifications. For underfloor areas, at least one field density test should be made per 5,000 square feet of fill area for each two-foot lift. Testing frequency should be increased in confined areas. Areas which do not meet the compaction specifications should be recompact to achieve compliance. In confined areas, such as utility trenches, the use of portable compaction equipment and thin lifts of 3 to 4

inches may be required to achieve compaction.

Excavations to the depths and at the locations explored can be accomplished using conventional heavy earthmoving equipment. No grading plan is available to see if all areas of deep excavations have been explored. If excavations in the vicinity of boring B-3 are planned to be deeper than 13 or so feet, partially weathered rock may be encountered, and difficult excavation techniques required to facilitate further excavation.

5.3 Groundwater Control

Based on the boring data, we do not anticipate that groundwater will be encountered in excavations. Rainwater and runoff which accumulate in footing excavations can be pumped out of small dug sumps. Groundwater levels are subject to seasonal, climatic, and other variations and may be different at other times and locations than those stated in this report.

5.4 Foundations

We recommend that the structures be supported on conventional shallow foundations bearing on the existing residual soil or new structural fill. A design bearing pressure of 3,000 psf is recommended. The recommended bearing pressure is based on correlations with the Standard Penetration Test results. These correlations imply that a maximum total settlement of one inch is possible and a maximum differential settlement of half the total settlement is possible. Minimum foundation widths of 24 inches and 18 inches are recommended for individual column and strip footings, respectively, to preclude the possibility of localized soil bearing failures. Exterior foundations should bear at least 18 inches below external grades to prevent frost damage.

As with any construction, all foundation excavations should be evaluated by a geotechnical engineer, who will verify that the design bearing pressure is available intermediate of boring locations, and that foundations are not immediately underlain by worse conditions. If the engineer finds localized conditions of weak or organic soil below an individual footing, it should be undercut or a lower bearing pressure used, depending upon the actual conditions found.

5.5 Soil Supported Slabs

Floor slabs may be soil supported, subject to the subgrade preparation and earthwork recommendations contained in this report. Crushed stone is not needed to support the slab loads and is considered optional.

5.6 Temporary and Permanent Slopes

Permanent and temporary slopes may be used to accommodate grade changes. If temporary slopes are used, they should be constructed no steeper than 1.5H: 1V for slopes less than 15 feet high. Permanent slopes should be constructed no steeper than 2H: 1V. These recommendations are based on our experience with similar conditions and no detailed slope stability analyses have been performed. All finished slopes should be suitably protected from erosion.



Buildings should be set back at least 10 feet from the top of slopes; a minimum 5-foot setback is considered sufficient for pavement areas. Note that the International Building Code (IBC) also mandates that all building foundations be set back from the edge of slope horizontally at least 1/3 of the slope's total height but not to exceed 40 feet, unless otherwise approved by both the geotechnical engineer and the "building official" responsible for the building code enforcement in any particular jurisdiction. In addition, the face of a structure should be set back from the toe of the slope at least 1/2 of the slope's total height not to exceed 15 feet.

6.0 QUALIFICATIONS OF RECOMMENDATIONS

This evaluation of the geotechnical aspects of the proposed design and construction has been based on our understanding of the project and the data obtained during this study. The general subsurface conditions used in our evaluation were based on interpolation of the subsurface data between the borings. Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions will differ between boring locations, that conditions are not as anticipated by the designers, or that the construction process has modified the soil conditions. Therefore, experienced soil engineers and technicians should evaluate earthwork and foundation construction to verify that the conditions anticipated in design actually exist. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications or recommendations.

The recommendations contained in this report have been developed on the basis of the previously described project characteristics and subsurface conditions. If project criteria change, we should be permitted to determine if the recommendations should be modified. The findings of such a review will be presented in a supplemental report. Even after completion of a subsurface study, the nature and extent of variation between borings may not become evident until the course of construction. If such variations then become evident, it will be necessary to reevaluate the recommendations of this report after on-site observations of the conditions.

These professional services have been performed, the findings derived, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all warranties either expressed or implied. This company is not responsible for the conclusions, opinions or recommendations of others based on these data.

APPENDIX

SOIL TEST BORING PROCEDURES (ASTM D-1586)

The soil test borings were advanced by twisting continuous auger flights into the ground. At selected intervals, soil samples were obtained by driving a standard 1.4 inch I.D., 2.0 inch O.D., split tube sampler into the ground. The sampler was initially seated six inches to penetrate any loose cuttings created in the boring process. The sampler is then driven an additional 12 inches by blows of a 140 pound "hammer" falling 30 inches. The number of blows required to drive the sampler the final foot is designated the Standard Penetration Resistance.

The samples recovered were sealed in glass jars and were transported to the office where they were classified by an engineer in general accordance with the Unified Soil Classification System (USCS).

**CORRELATION OF STANDARD PENETRATION RESISTANCE WITH
RELATIVE COMPACTNESS AND CONSISTENCY**

Sand and Gravel

Standard Penetration Resistance Blows / Foot -----	Relative Compactness -----
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
Over 50	Very Dense

Silt and Clay

Standard Penetration Resistance Blows / Foot -----	Relative Compactness -----
0 - 1	Very Soft
2 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
31 - 50	Hard
Over 50	Very Hard



LEGEND

 SOIL TEST BORING LOCATIONS

FIGURE 1: SITE AND BORING LOCATION PLAN

COBB PARKS MAINTENANCE BUILDING
 COUNTY SERVICES PARKWAY
 MARIETTA, GEORGIA



3000 NORTHFIELD PLACE, SUITE 1100
 ROSWELL, GA 30076

DRAWN BY: CB
APPROVED BY: JS
PROJECT NO.: 2349
DATE: 11.11.2022
SCALE: NTS

NOTES:

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
			CH	INORGANIC CLAYS OF HIGH PLASTICITY	
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
ALLUVIUM			PT	ALLUVIUM, PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	
FILL			FILL	MATERIAL PLACED BY MAN	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Parks Maintenance Building

DEPTH (FT)	DESCRIPTION	ELEV.	BLOW COUNTS	PENETRATION (BLOWS PER FOOT)							N VALUE	
				10	20	30	40	60	80	100		
	TOPSOIL: 2 inches RESIDUUM: Very stiff to stiff orange tan fine sandy SILT (ML)		7-10-13		23							23
5			6-7-7		14							14
	Medium dense brown silty fine SAND (SM), rock fragments		5-6-5		11							11
10	Stiff orange tan gray fine sandy SILT (ML), slightly micaceous		5-4-6		10							10
15			5-6-5		11							11
20	Boring terminated at 20 feet		4-5-6		11							11
25												
30												
35												
40												

REMARKS: No groundwater encountered at time of boring.

SOIL BORING RECORD

BORING NUMBER	B-1
DATE DRILLED	11/14/2022
PROJECT NUMBER	2349
PAGE	1 of 1

- ▽ Groundwater level at time of boring
- ▼ Groundwater level - 24 hrs
- Ⓢ Caved depth - 24 hrs
- ⊠ Standard penetration test
- Undisturbed sample

Parks Maintenance Building

DEPTH (FT)	DESCRIPTION	ELEV.	BLOW COUNTS	PENETRATION (BLOWS PER FOOT)							N VALUE	
				10	20	30	40	60	80	100		
	TOPSOIL: 3 inches RESIDUUM: Stiff red brown silty CLAY (CL)		5-5-6									11
5	Very stiff red brown fine sandy SILT (ML), trace clay, slightly micaceous		12-13-16									29
	Stiff to very stiff orange brown fine sandy SILT (ML)		10-8-8									16
10			6-7-22									29
	Medium dense tan gray silty fine SAND (SM), slightly micaceous		7-10-8									18
15			7-7-7									14
20	Boring terminated at 20 feet											
25												
30												
35												
40												

REMARKS: No groundwater encountered at time of boring.

SOIL BORING RECORD

BORING NUMBER	B-2
DATE DRILLED	11/14/2022
PROJECT NUMBER	2349
PAGE	1 of 1

- ∇ Groundwater level at time of boring
- ▼ Groundwater level - 24 hrs
- C** Caved depth - 24 hrs
- ⊠ Standard penetration test
- Undisturbed sample

Parks Maintenance Building

DEPTH (FT)	DESCRIPTION	ELEV.	BLOW COUNTS	PENETRATION (BLOWS PER FOOT)						N VALUE	
				10	20	30	40	60	80		100
	TOPSOIL: 2 inches										
	RESIDUUM: Very stiff to stiff gray orange brown fine sandy SILT (ML)		6-11-7								18
5			7-6-3								9
	Medium dense tan brown silty fine SAND (SM), slightly micaceous, rock fragments		4-5-6								11
10			5-5-7								12
	PARTIALLY WEATHERED ROCK: Sampled as very dense white gray silty fine SAND (SM)		11-50/6"								50/6"
15											
20	Boring terminated at 20 feet		50/5"								50/5"
25											
30											
35											
40											

REMARKS: No groundwater encountered at time of boring.

SOIL BORING RECORD

BORING NUMBER	B-3
DATE DRILLED	11/14/2022
PROJECT NUMBER	2349
PAGE	1 of 1

- Groundwater level at time of boring
- Groundwater level - 24 hrs
- Caved depth - 24 hrs
- Standard penetration test
- Undisturbed sample

Parks Maintenance Building

DEPTH (FT)	DESCRIPTION	ELEV.	BLOW COUNTS	PENETRATION (BLOWS PER FOOT)							N VALUE	
				10	20	30	40	60	80	100		
	TOPSOIL: 4 inches											
	RESIDUUM: Firm tan orange fine sandy SILT (ML)		3-4-4		●							⊗ 8
5	Very stiff to stiff tan orange fine sandy SILT (ML)		6-7-12			●						⊗ 19
			7-5-6		●							⊗ 11
10			5-6-6		●							⊗ 12
15	Medium dense gray brown silty medium to fine SAND (SM), micaceous		11-20-8				●					⊗ 28
20	Medium dense gray brown silty fine SAND (SM), micaceous		5-6-9				●					⊗ 15
	Boring terminated at 20 feet											
25												
30												
35												
40												

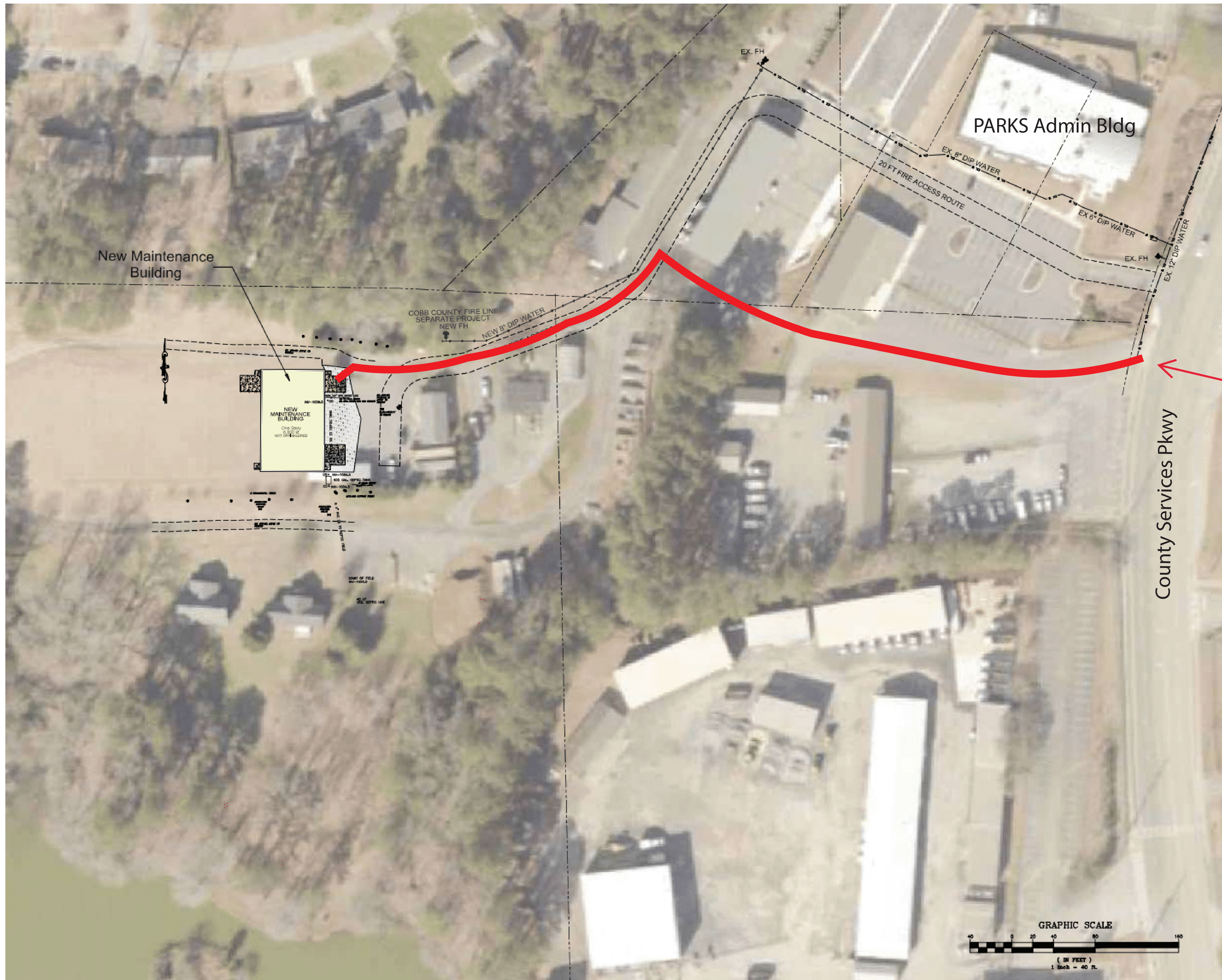
REMARKS: No groundwater encountered at time of boring.

SOIL BORING RECORD

BORING NUMBER	B-4
DATE DRILLED	11/14/2022
PROJECT NUMBER	2349
PAGE	1 of 1

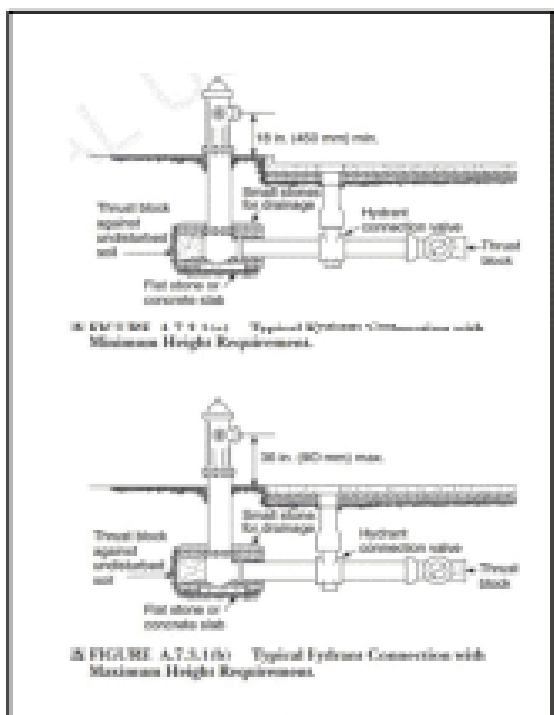
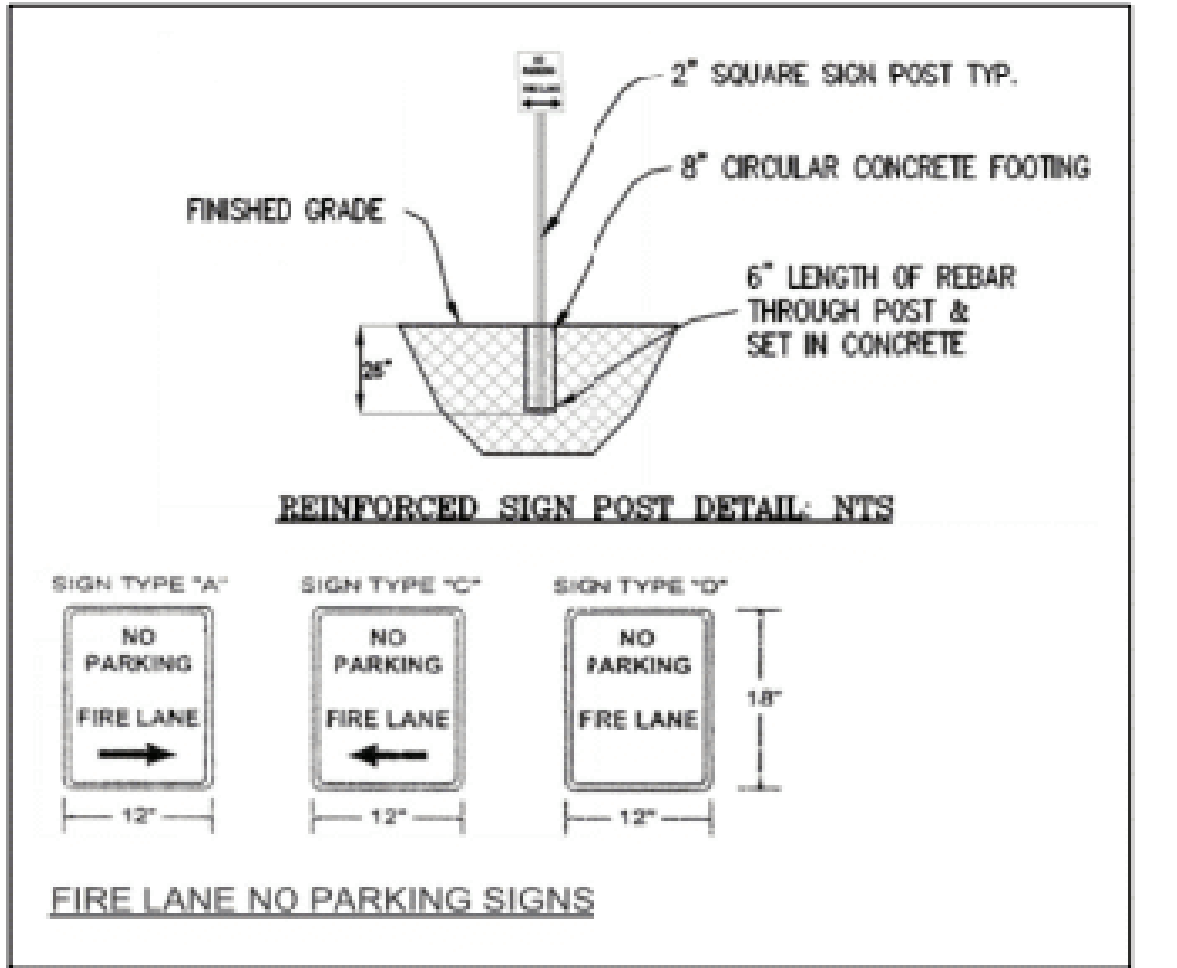
- ▽ Groundwater level at time of boring
- ▼ Groundwater level - 24 hrs
- Ⓒ Caved depth - 24 hrs
- ⊗ Standard penetration test
- Undisturbed sample

Appendix B

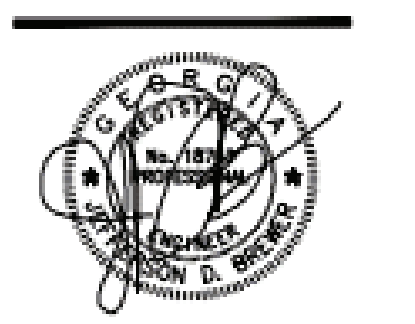
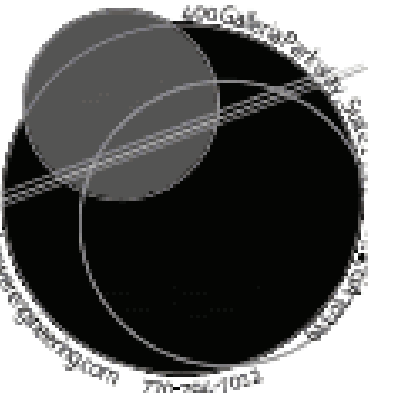


- FIRE SIGN NOTES:**
1. SIGNS SHALL BE A MINIMUM OF 12 INCHES WIDE BY 18 INCHES HIGH, HAVE RED LETTERS ON A WHITE BACKGROUND, SIGNS SHALL READ "NO PARKING FIRE LANE" TO THE RIGHT OF THE SIGN.
 2. LETTERS SHALL BE MINIMUM 2 INCHES IN HEIGHT, THE LINES LESS THAN 1/8" FEET LENGTH SHALL BE CENTERED IN THE MIDDLE OF THE LINE, ONE SIGN SHALL BE POSTED AT THE BEGINNING OF THE FIRE LANE AND ONE AT THE END OF THE FIRE LANE WITH SIGNS NOT MORE THAN 100 FEET APART.
 3. SIGNS SHALL NOT BE MORE THAN 4 FEET FROM EDGE OF CURB AND SHALL BE VISIBLE FROM BOTH DIRECTIONS OF TRAVEL.
 4. HEIGHT OF SIGNPOST AS MEASURED FROM BOTTOM OF SIGN SHALL BE A MINIMUM OF 4 FEET AND A MAXIMUM OF 7 FEET FROM GRADE LEVEL.
 5. LINES 20 TO 28 FEET WIDE AND SIGNS WILL BE REQUIRED ON BOTH SIDES.
 6. LINES 29 TO 37 FEET WIDE AND SIGNS WILL BE REQUIRED ON ONE SIDE.
 7. THE LINES IN EXCESS OF 37 FEET NO SIGNS OR MARKINGS ARE REQUIRED.
 8. THE SIGNPOSTS ON BOTH SIDES OF THE FIRE LANE SHALL BE PAINTED RED, EVERY OTHER SIGN SHALL CONFORM TO THE SUBJECT OF THIS SIGNPOST. SIGNPOSTS SHALL CONFORM TO A 2" SQUARE OR CIRCULAR SIGNPOST, COBB COUNTY CODE SECTION 17-2-27.
 9. SHOW THE NO PARKING THE SAME DETAIL IN SINGLE FRAME WITH DIMENSIONS.
 10. THE TPO SIGN SHALL BE A MINIMUM OF A 12 INCH BY 18 INCH METAL SIGN WITH RAISED LETTERS AT LEAST 1/2 INCH IN SIZE SHALL BE LOCATED ON ALL FIRE DEPARTMENT CONNECTIONS SERVING AUTOMATIC SPRINKLER, STANDPIPES OR FIRE PUMP CONNECTIONS, SUCH SIGNS SHALL READ "AUTOMATIC SPRINKLER OR STANDPIPE OR TEST CONNECTION OR A CONNECTION THEREOF AS APPLICABLE. ONLY ONE TPO IS PERMITTED PER BUILDING UNLESS APPROVED BY CDDMO, MANUAL STANDPIPES REQUIRE ADDITIONAL SIGNAGE.
 11. ALL FIRE SIGNS SHALL BE DUTY FREE CONNECTIONS TO AMATEUR OR AMFA (FOR CODES SECTION) COMMERCIAL AND MULTIFAMILY RESIDENTIAL WATER SUPPLY TO HYDRANTS REQUIRED TO BE INSTALLED BY THE OWNER.
 12. ALL SIGNS SHALL NOT COVER UNDER THE BUILDING MORE THAN 10 FEET AS MEASURED FROM THE OUTSIDE EDGE OF THE BUILDING TO THE CENTER OF THE SIGNPOST.
 13. ALL NEW UNDERGROUND FIRE LINES SHALL BE INSTALLED IN ACCORDANCE WITH NFPA 242.11 AND BE SUBJECT TO THE COBB COUNTY FIRE MARSHAL'S REVIEW. THE UNDERGROUND LINES SHALL BE COMPLETELY FILLED BEFORE THE CONNECTION MADE TO DOWNSTREAM FIRE PROTECTION SYSTEMS.
 14. BURIAL DEPTH OF ALL NEW UNDERGROUND FIRE LINES SHALL NOT BE LESS THAN 48 INCHES MEASURED VERTICALLY FROM THE TOP OF PIPE TO THE FINISHED DRIVE (EXPOSED) ROAD.
 15. THE PLAN APPROVAL DOES NOT INCLUDE TANKS, TANKS SHALL BE IDENTIFIED SEPARATELY AT CONSTRUCTION. INSPECTIONS ARE REQUIRED TO BE SCHEDULED ONLINE AT WWW.COBBGEOGRAPHIC.COM.
 16. WATER MUST BE IDENTIFIED AND APPROVED BY THE FIRE MARSHAL'S OFFICE BEFORE ANY GATES ARE INSTALLED.
 17. SCHEDULE A FINAL GATE INSPECTION AT COMPLETION.
 18. ANY OTHER MEANS OF ACCESS COMPONENT SHOWN THESE PLANS OUTSIDE OF THE LAND DISTURBANCE PERMIT REVIEW PROCESS, ALL SIGNS AND OTHER MEANS OF ACCESS COMPONENT MUST BE SUBMITTED FOR REVIEW AND APPROVAL BY THE FIRE MARSHAL'S OFFICE PRIOR TO CONSTRUCTION.
 19. ALL DISTURBANCE OF FIRE PROTECTORS, STANDPIPES, STANDPIPES AND HYDRANTS WILL BE DURING THE LIFE SPAN OF THE FIRE SUPPLY CODE PLAN REVIEW FOR THE BUILDING, ALL NECESSARY REPAIRS CONTAINED ON THESE PLANS ARE BASED ON INITIAL REVIEW AND ARE SUBJECT TO BE ACCEPTED AS SCHEDULED DUE TO THE ACCESS ON OTHER ISSUES WITH THE SITE, IF THE SITE PLANS CONTAINED REPAIRS FOR THE PROTECTORS SYSTEMS THE SITE APPROVAL IS CONTINGENT ON PROVIDING THE REQUIRED SYSTEMS.
 20. ALL COBB COUNTY FIRE MARSHAL'S OFFICE INSPECTIONS ARE REQUIRED TO BE SCHEDULED ONLINE AT WWW.COBBGEOGRAPHIC.COM.
 21. STREET NUMBERS SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 17-2-27 COBB COUNTY CODE. THESE SIGNS SHALL BE ON THE STREET SIDE OF THE BUILDING, NOT LESS THAN 4 FEET FROM NUMBER AND BE REFLECTIVE ON A CONTRASTING BACKGROUND OR CONTRASTING NUMBER ON A REFLECTIVE BACKGROUND, WHERE NEIGHBORING SIGNS ARE USED ADDRESS NUMBERS SHALL BE INSTALLED ON BOTH SIDES OF THE MOBILE HOME, SALES AND BUILDING NUMBER SHALL COMPLY WITH SECTION 17-2-27 COBB COUNTY CODE.
 22. PROJECTS WHERE NEW HYDRANTS WILL BE INSTALLED, THE HYDRANTS SHALL BE FLUSHED, TESTED AND INSPECTED BY THE FIRE MARSHAL'S OFFICE PRIOR TO COMMENCING WITH CONSTRUCTION WORK ON ANY STRUCTURE, THESE HYDRANTS CONSTRUCTION CAN PROCEED FROM THE HYDRANT TEST AND INSPECTION.
 23. MAINTAIN ACCESS FOR THE APPROPRIATE TO ALL BUILDINGS UNDER CONSTRUCTION INCLUDING THOSE OF PAVE OR WALK, ROADS SHALL BE MAINTAINED AND MAINTAINED PROVIDED WITH GRADED STONE BASE AT 2 FEET DEPTH.
 24. THE OWNER AND DEVELOPER SHALL SUBMIT A PREVENTION PROGRAM SUPERINTENDENT IN ACCORDANCE WITH FC 338 AND AFD 241. THE OWNER/DEVELOPER SHALL NOTIFY THE FIRE MARSHAL AT THE START OF CONSTRUCTION WITH THE NAME AND CONTACT INFORMATION FOR THE SUPERINTENDENT, THE SUPERINTENDENT SHALL BE FAMILIAR WITH THE PROVISIONS OF FC 338 AND AFD 241 AS ADAPTED BY THE STATE OF GEORGIA.
 25. FC 338 EMERGENCY RESPONSE AND COORDINATION SIGNAL TESTING WILL BE REQUIRED FOR ALL NEW BUILDINGS OR BUILDINGS WITH SUBSTANTIAL RENOVATIONS.
 26. THE HYDRANT MUST BE TESTED AND APPROVED PRIOR TO ANY CONSTRUCTION.
 27. ALL UNDERGROUND WATER MAINS MUST BE INSPECTED BY CDDMO PRIOR TO COVERING.
 28. A CHECK VALVE MUST BE PROVIDED FOR THE FC 338. CHECK VALVE MUST HAVE THE CHECK VALVE AT THE BASE OF THE REMOTE FC 338 WITH A BALL STOP, WHEN THE HYDRANT IS CLOSED CHECK VALVE MAY BE REQUIRED TO PREVENT BACKFLOW OF WATER TO HYDRANTS.
 29. THE LINES WILL BE DETERMINED BY THE REVIEWER AFTER ALL COMMENTS ARE ADDRESSED OR AS DETERMINED BY THE INSPECTOR PRIOR TO THE FINAL INSPECTION OF THE SITE.
 30. THE OWNER/DEVELOPER SHALL NOTIFY THE FIRE MARSHAL AT THE START OF CONSTRUCTION WITH THE NAME AND CONTACT INFORMATION FOR THE SUPERINTENDENT, THE SUPERINTENDENT SHALL BE FAMILIAR WITH THE PROVISIONS OF FC 338 AND AFD 241 AS ADAPTED BY THE STATE OF GEORGIA.
 31. SCHEDULE A FINAL GATE INSPECTION AT COMPLETION.
 32. DETAILS WHERE THE OWNER/DEVELOPER HAS CHANGES TO THE FINAL GATE.
 33. SIGNS SHALL BE INSTALLED FOR NEW BUILDINGS, BUILDING ADDITIONS OR BUILDINGS UNDERGOING SUBSTANTIAL RENOVATION, WHEN SYSTEMS PERFORMING SUCH EXCEPTED SHALL NOT BE ACCEPTED.
 34. TRANSFORMER MUST BE AT LEAST 14 FEET FROM BUILDING, OVERHANGS, CANOPIES, EXTENDED HALLS, BALCONY, EXTERIOR STAIRS, WALKWAY OR WALL OPENINGS, TRANSFORMER MUST BE AT LEAST 14 FEET FROM ANY OCCURRING WATER THE UTILITY COMPANY PLAN.

Construction Access



SPR2022-00
- Clearance around fire hydrants



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1-12-23		PERMIT PACKAGE

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Marietta, GA 30060

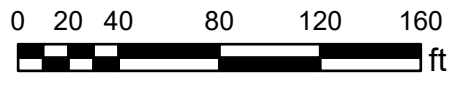
Cobb County Parks
New Maintenance Building
1792 County Services Parkway
Marietta, GA 30008

NOT ISSUED FOR CONSTRUCTION

PROJECT NO: 22068
DATE: 12-16-2022
SHEET TITLE: OVERALL SITE PLAN
SHEET NO: C-1.0



Appendix C

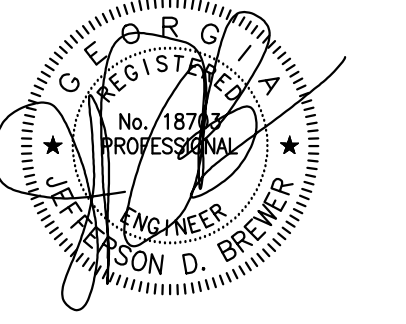
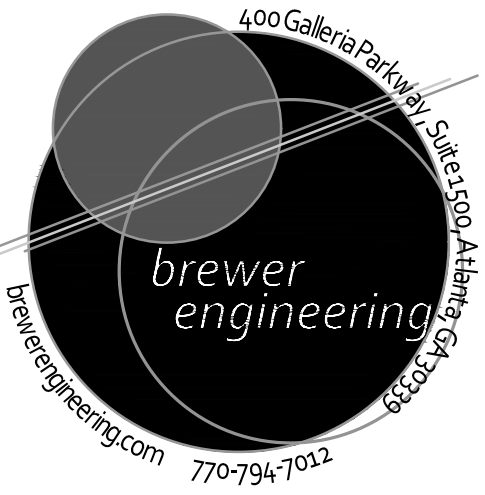


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Appendix D



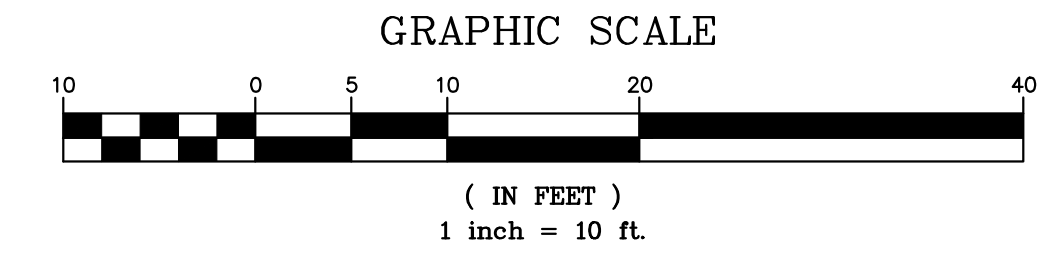
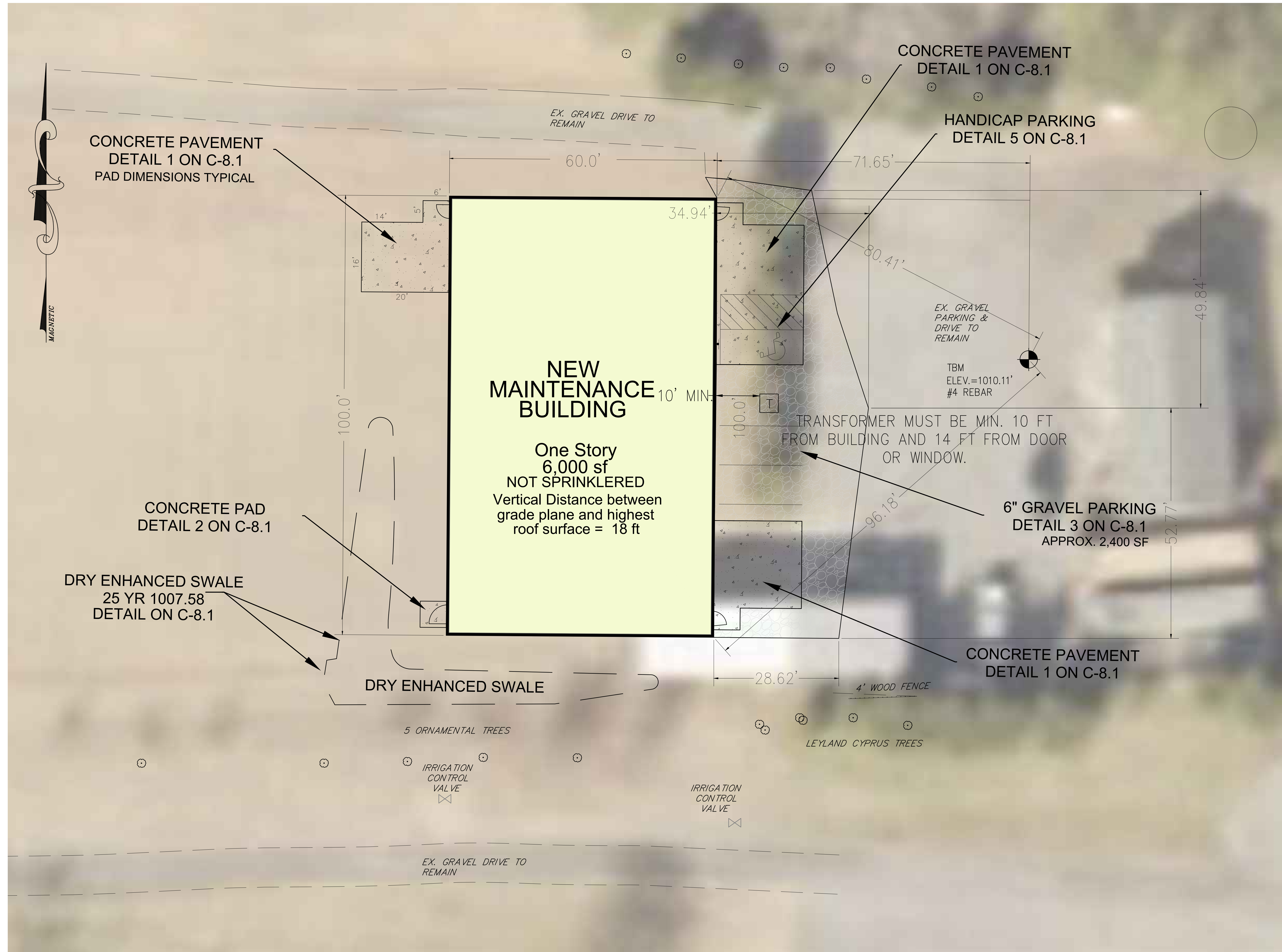
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2-	12-23	PERMIT COMMENTS

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 Suite 300
 Marietta, GA 30060

Cobb County Parks
New Maintenance Building
 1792 County Services Parkway
 Marietta, GA 30068



PROJECT NO.:
 22068
 DATE:
 12-16-2022
 SHEET TITLE:

SITE PLAN

SHEET NO.:
C-3.0

Appendix E

LEVEL 3 SOIL STUDY REPORT

Report Date: October 7, 2022
 Client: Cobb County Parks / Barbara Savage / Phillip Crisp
 Site Location: 1792 County Services Parkway, Marietta, Cobb County, GA

Via Email (8 Pages Total)
 Report Number: 22-023A/7
 Phone: 770-256-6416
 Email: Phil.Crisp@meconline.com

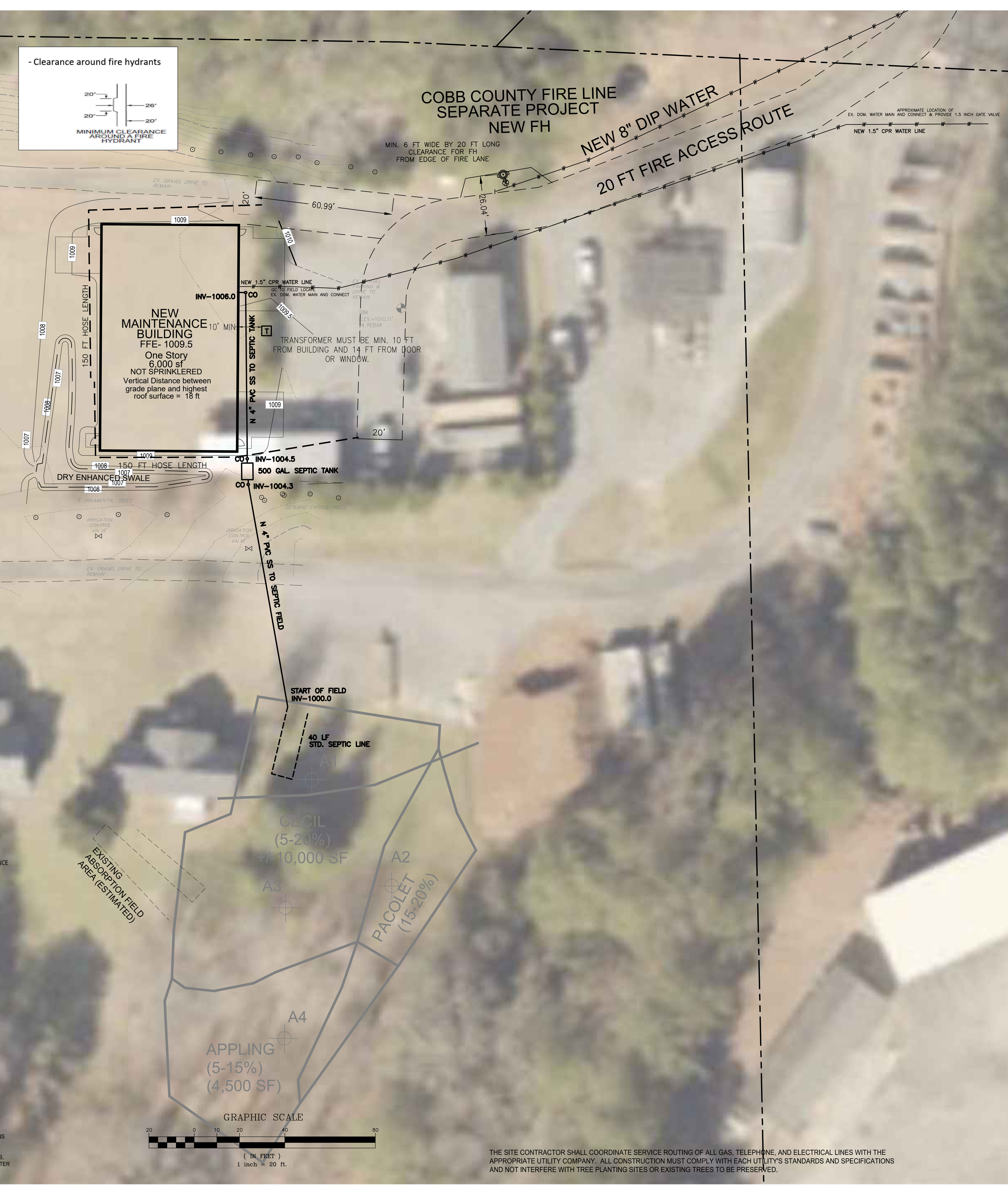
Soil Series	Slope Gradient (%)	Depth to Bedrock (ft)	Depth to Seasonal High Water Table (feet)	Depth to Seasonal High Water Table (feet)	Estimated Absorption & Long Term Absorption		Recommended Absorption Depth / Trench Depth (feet)	Soil Suitability Code (Land Use)
					Estimated	Verified		
Appling	5-15	>2'	>2'	>2'	10.0 GPD/SF	20.0 GPD/SF	20-24"	A1, B1
Level	5-20	>2'	>2'	>2'	10.0 GPD/SF	20.0 GPD/SF	20-24"	A1, B1
Dunwoody	15-20	>2'	>2'	>2'	10.0 GPD/SF	20.0 GPD/SF	20-24"	A1, B1

1) Depth to bedrock based on auger refusal where test pits have not been conducted.
 2) Long Term Absorption Rate based on GPD/Inch flow rate and 24-hour soak to full length conventional absorption field.

Stability Code Descriptions:
 A1 - Soil types typically have ability to function as suitable absorption field with proper design, installation and maintenance. If needed, hydraulic conductivity may need to be confirmed by laboratory testing.
 B1 - Soils generally considered suitable for conventional absorption field, and have high probability of failure.
 C1 - One to two absorption rates, these soils appear poorly suited to conventional absorption fields. These soils should function for drip systems at a 12" depth with a loading rate of 0.5 GPD/SF. Additional testing (including additional hydraulic conductivity tests) could be conducted to further determine suitability for conventional systems.
 D1 - Recommendation: 1) A full depth seepage absorption system (Type 1B) OR Manual GDSMS 2019 with equal distribution to recommended depth (not required due to variable site conditions, to avoid creating localized high water areas, and to increase absorption field life. 2) Where landscape conditions are poor, especially drainage features and direction, the area should be avoided and/or site alterations such as grading, diversion berms, and/or erosion drains are recommended under more suitable soils. 3) In 18" (horizontal) soil conditions, the soil may be suitable to provide sufficient absorption field. 4) To protect the absorption field and avoid meeting the trench surface and/or disturbing the soil structure the following are required: a) the proposed absorption field area must be protected at all times, especially during construction activities; b) any track type equipment is allowed on the proposed field area is used only for grading or stockpiling of materials to be contained in the absorption field area, and the absorption field should be installed during dry weather conditions.

General Notes:
 1) All Absorption Fields 18" horizontal and vertical soil test.
 2) Field services conducted on September 19, October 4, 2022.
 3) Materials tested from selected sites: (see Figure 1) and a Franklin Co. GPS.
 4) This soil survey was conducted in general accordance with the Georgia Manual For On-Site Sewage Management Systems, requirements for a Level 3 Soil Survey, and Proposed 22-023A/7 with Terms Conditions.
 5) This soil survey does not guarantee the performance of any septic system or absorption field installed on the property. Report is valid in areas where significant grading or stockpiling occurs after field services, requiring additional testing to confirm soil conditions.
 6) Soil boundaries based on limited soil borings, and interpolation between these borings, they meet the minimum density standards for a Level 3 Soil Study. Conditions for test pits and filled areas may exist on the property that could not be identified within the scope of the assessment or that were not reasonably identifiable from the available information.

Prepared/Certified by: *William H. Stone* Date: 07-07-2022
 William H. Stone, P.E., P.S., P.G.
 AAA Environmental Solutions, Inc. 2865 Wood Park Trail NW, Kennesaw, GA 30142, 404-275-8491, Office/Fax 770-975-9219, www.aaes.com



REVISIONS

NO.	DATE	DESCRIPTION
1-13-21		PERMIT PACKAGE
7-22-21		PERMIT COMMENTS

Utility Abbreviation Legend

SYMBOL	DESCRIPTION
BFP	BACKFLOW PREVENTOR
CI	CAST IRON OR CURB INLET
CO	CLEAN OUT
DCC	DOUBLE DETECTOR CHECK VALVE
DI	DROP INLET
DIP	DUCTILE IRON PIPE
RCP	REINFORCED CONCRETE PIPE
DW	DOMESTIC WATER
FDC	FIRE DEPARTMENT CONNECTION
FL	FIRE LINE
GM	GAS METER
GV	GATE VALVE
INV	INVERT
LA	LATERAL
MH	MANHOLE
PIV	POST INDICATOR VALVE
RD	ROOF DRAIN
SS	SANITARY SEWER
WM	WATER METER
WV	WATER VALVE
SWCB	SINGLE WING CATCH BASIN
DWCB	DOUBLE WING CATCH BASIN
DI	DROP INLET
JB	JUNCTION BOX
MH	MANHOLE
SSMH	SEWER MANHOLE

Utility Pipe Legend

SYMBOL	DESCRIPTION
EX - W	EXISTING WATER LINE
EX - SS	EXISTING SANITARY SEWER
EX - G	EXISTING UNDERGROUND GAS
EX - E	EXISTING UNDERGROUND POWER
EX - T	EXISTING UNDERGROUND TELEPHONE
EX - UC	EXISTING UNDERGROUND CABLE
N - DW	NEW DOMESTIC WATER LINE
N - 8"FL	NEW FIRE LINE
N - 6"SS	NEW SANITARY SEWER
N - UG	NEW UNDERGROUND GAS
N - UE	NEW UNDERGROUND ELECTRICAL
N - UT	NEW UNDERGROUND TELEPHONE
N - UC	NEW UNDERGROUND CABLE
N - 6"RD	NEW ROOF DRAIN
N - 2"IR	NEW IRRIGATION LINE

OWNER / Developer
 Cobb County
 100 Cherokee Street
 Suite 300
 Marietta, GA 30060

Septic System Notes:

- NO SHOWERS, LAUNDRY FACILITIES OR FLOOR DRAINS ARE LOCATED IN THIS DESIGN.
- PUBLIC WATER SERVICES SITE
- GRADING CAN AFFECT SOIL SUITABILITY FOR FIELD LINES AND MAY VOID THE USE OF A LOT FOR AN ON-SITE SEWAGE MANAGEMENT SYSTEM. FURTHER SOIL STUDY MAY BE REQUIRED PRIOR TO ISSUANCE OF A SEPTIC TANK PERMIT OR APPROVAL OF AN ON-SITE SEWAGE MANAGEMENT SYSTEM.
- TRASH RUBIAL PIT LOCATIONS MUST BE REPORTED TO THE COBB COUNTY ENVIRONMENTAL HEALTH DEPARTMENT PRIOR TO ISSUANCE OF SEPTIC TANK PERMIT.
- BOD5 AND TSS NOT TO EXCEED 200 mg/l
- GENERAL CONTRACTOR MUST INSTALL, CONSTRUCT AND PROVIDE THE ENTIRE ON-SITE SEWAGE MANAGEMENT SYSTEM SHOWN ON THESE PLANS (PIPPING, DOSING TANKS, GREASE TRAPS, SEPTIC TANKS, DISTRIBUTION BOXES, ABSORPTION FIELD, ETC.) IN ACCORDANCE AND COMPLIANCE WITH THE GEORGIA DEPARTMENT OF HUMAN RESOURCES DIVISION OF PUBLIC HEALTH "MANUAL FOR ON-SITE SEWAGE MANAGEMENT SYSTEM" MOST CURRENT EDITION.

SEPTIC SYSTEM CALCULATIONS

12 EMPLOYEES x 5 GPD = 60 GPD
 ABSORPTION FIELD CALCULATION = 1/5.45 (60) = 81 SF REQUIRED
 MIN. STANDARD FIELD = 81 SF / 3 = 27 LF STANDARD FIELD REQUIRED
 TOTAL STANDARD FIELD PROVIDED 40 FT

I CERTIFY THIS ON-SITE SEWAGE MANAGEMENT SYSTEM MEETS THE MINIMUM DESIGN REQUIREMENTS ESTABLISHED BY THE DEPARTMENT OF PUBLIC HEALTH. I HAVE MADE A SITE VISIT TO VERIFY THE SYSTEM CAN BE INSTALLED AS DESIGNED IN ACCORDANCE WITH THESE REQUIREMENTS.

TO THE BEST OF OUR KNOWLEDGE THE PROFESSIONAL ENGINEER STAMPED PLANS SIGNIFY CONFORMANCE TO ALL GEORGIA STATE AND COBB COUNTY CODES. FURTHER, DESIGN PROFESSIONAL ARCHITECT & OWNER MAINTAIN THE SOLE RESPONSIBILITY FOR THE DESIGN AND FOR CORRECTING ALL ERRORS, OMISSIONS, PROBLEMS, AND CODE VIOLATIONS (IF ANY) EXPOSED DURING CONSTRUCTION AFTER AUTHORIZATION BY COBB COUNTY

THE SITE CONTRACTOR SHALL COORDINATE SERVICE ROUTING OF ALL GAS, TELEPHONE, AND ELECTRICAL LINES WITH THE APPROPRIATE UTILITY COMPANY. ALL CONSTRUCTION MUST COMPLY WITH EACH UTILITY'S STANDARDS AND SPECIFICATIONS AND NOT INTERFERE WITH TREE PLANTING SITES OR EXISTING TREES TO BE PRESERVED.

COBB COUNTY ARBORIST OR LANDSCAPE ARCHITECT MUST APPROVE THE SITE LIGHTING PLAN. LIGHT POLES ARE NOT PERMITTED IN PARKING PENINSULAS, ISLANDS AND MEDIANS WITHOUT THE PRIOR APPROVAL OF THE COUNTY ARBORIST. 20 FT MINIMUM SPACING IS REQUIRED BETWEEN THE TRUNK AND ANY PROPOSED OVER-STORY HARDWOOD TREES (OR EXISTING TREES COUNTED FOR TREE ORDINANCE CREDIT) AND ANY EXISTING OR PROPOSED LIGHT POLE. IF THE SERVICE PROVIDER (ELECTRIC COMPANY) PRODUCES A LIGHTING PLAN, IT MUST ADHERE TO THE SYSTEMS PER ITS 510.1 EXCEPTION 1 WILL NOT BE ACCEPTED.

TRANSFORMER MUST BE AT LEAST 10 FEET FROM BUILDING, OVERHANGS, CANOPIES, EXTERIOR WALLS, BALCONY, EXTERIOR STAIRS, WALKWAY OR WALL OPENINGS. TRANSFORMER MUST BE AT LEAST 14 FEET FROM ANY WATER (THE UTILITY COMPANY PLAN).

ALL INTERMEDIATE CONTROL VALVES ON THE FIRE LINE SHALL BE EQUIPPED WITH A ROADWAY BOX.

ALL HYDRANTS SHALL BE PAINTED SILVER. REFLECTIVE TAPE 1 INCH WIDE SHALL BE PLACED AROUND THE ORANGE CIRCLES OF THE BONNET WITH THE ENDS OVERLAPPED 1". PRIVATE HYDRANTS SHALL USE COBB COUNTY FMO APPROVED REFLECTIVE TAPE. GO TO COBBFMO.ORG FOR INFO ON APPROVED REFLECTIVE TAPE.

THE OWNER HEREBY DESIGNATES JERRY FOUNTAIN AS THE FIRE PREVENTION PROGRAM SUPERINTENDENT. THE ABOVE NAMED PERSON SHALL BE RESPONSIBLE FOR COMPLIANCE WITH FC CHAPTER 3300 IN ITS ENTIRETY AND NFPA 241-08. FAILURE TO COMPLY CAN RESULT IN STOP WORK ORDERS AND/OR CITATION.

UTILITY PLAN

PROJECT NO.: 22068
 DATE: 12-16-2022
 SHEET TITLE: UTILITY PLAN
 SHEET NO.: C-5.0

SPR 2022-00563
 CONTRACTOR MUST CALL THE UTILITY PROTECTION CENTER CALL BEFORE YOU DIG! TELEPHONE NUMBER (1-800-382-7411) FOUR (4) DAYS BEFORE EXCAVATION.

GEORGIA811 Know what's below. Call before you dig. Dial 811 or Call 800-282-7411