SPECIFICATIONS

FOR

BRANCH BANK
FOR
TRADERS AND FARMERS BANK

DOUBLE SPRINGS, ALABAMA

NOVEMBER 30, 2017

LAMBERT EZELL DURHAM

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JOB NO. 1612 SET NO. _____

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SECTION 00 21 13 – INSTRUCTIONS TO BIDDERS

1.1 Bid Date: Bids from invited General Contractors will be received until 2:00 p.m., C.S.T., Thursday, March 8, 2018 in the offices of Traders & Farmers Bank, 819 20th St, Haleyville, AL 35565.

1.2 Pre-Bid Conference: A mandatory Pre-Bid Conference for all bidding General Contractors will be held at 3:00 p.m. C.S.T. on Thursday, February 8, 2018 at the Traders & Farmers Community Building, 10 Blake Drive, Double Springs, AL 35553.

1.3 Contract Documents:

A. Copies of the Drawings and Specifications may be obtained at the office of Lambert Ezell Durham Architecture, LLC, P.O. Box 934, 401 East College Street, Florence, Alabama 35631 upon deposit of $200.00 per set payable to the Architect. Any unsuccessful bidder, upon returning such set in good condition within ten (10) days after the bid date, will be refunded his deposit. General Contractors not submitting a Bid after obtaining Drawings and Specifications will be refunded their deposit less cost of reproduction upon return of such sets in good condition. Separate sheets of Drawings and Specifications are available from the Architect for $2.50 per print and $.15 per page of Specifications. Cost of reproduction will be charged on all sets in excess of one (1) to General Contractors.

B. Electronic images of the documents may be viewed on-line and printed by General Contractors, Subcontractors, and Suppliers by obtaining documents through the Architect's website, www.ledarchitecture.com by sending an email to info@ledarchitecture.com to obtain log-in information and password. Provide company name, address, telephone number, email address and GC license number in the email request. The Drawings and Specifications may also be examined at the Plan Rooms of DODGE Data & Analytics, Hot Springs, Arkansas; CMD Group, Norcross, Georgia, AGC Plan Room, Florence, Alabama, and at the office of the Architect.

1.4 Site: Bidders shall examine the site and all conditions thereon since the proposal must take into consideration all such conditions as may affect work. Should the General Contractor find any structures existing on the site not indicated on the Drawings, he shall notify Architect prior to Bid Date.

1.5 Proposals: Proposals shall be submitted in duplicate on the form accompanying these Specifications. Additional copies may be obtained at the Architect's office, or the Proposal may be submitted on a photocopy of the Proposal Form.

A. All bidders must include the bidder's current license number displayed on the sealed envelope in which the bid is delivered or the bid will not be accepted.

B. All blanks on the form shall be filled; numbers shall be given both in words and figures; no part of the form shall be deleted; no unauthorized statements shall be added; and the signature shall be both printed and in writing.

C. No oral, telegraphic, or telephonic proposals or modifications of submitted proposals shall be considered.

1.6 Addenda: Neither Owner nor Architect will give or be responsible for any oral instructions. If

information is needed, Addenda will be issued to all Bidders. Should Bidders find any discrepancies, omissions, ambiguities, or conflicts in or among Contract Documents or be in doubt as to their meaning, bring questions to attention of the Architect not later than three (3) days prior to date for receipt of Bids. Question will be reviewed and where information sought is not clearly indicated or specified, a clarifying Addendum will be issued which will become a part of the Contract.

1.7 Bonds:

A. Each Proposal shall be accompanied by a Bid Guarantee of not less than Five Percent (5%) of the amount of the Base Bid, which may be a Bid Bond, Certified Check, or Cashier's Check made payable to the Owner.

B. A satisfactory Performance Bond and Payment Bond, each in an amount equal to One Hundred Percent (100%) of the Contract Sum will be required of the successful Bidder.

1.8 Obligation:

A. The Owner reserves the right to reject any or all Proposals and waive technicalities.

B. No Bidder may withdraw his Bid for a period of thirty (30) days after time set for receiving Bids.

END OF SECTION 00 21 13

SECTION 00 22 00 — GENERAL AND SUPPLEMENTARY CONDITIONS

PART 1 — GENERAL

1.1 General Conditions: "The General Conditions of the Contract for Construction", American Institute of Architects Document A201-2007, including Articles 1-15 inclusive and pages 1-39 inclusive, is hereby made a part of the Contract Documents with the same force and effect as though set forth in full. This Document is on file in the Architect's office for the Contractor's review.

1.2 Supplementary Conditions: The following supplements modify, change, delete from or add to the "General Conditions of the Contract for Construction", AIA Document A201-2007. Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered Provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

ARTICLE 2: OWNER:

Delete Subparagraph 2.2.5 in its entirety and substitute the following:

2.2.5 The Contractor will be furnished free of charge fifteen (15) copies of Drawings and Specifications. Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 3: CONTRACTOR:

Add the following Subparagraph 3.8.4 to Paragraph 3.8:

3.8.4 Allowances: The Contractor shall include the following cash allowances in the Base Bid:

.1 Four Hundred Dollars Per Thousand ($400.00/M) for Face Brick (materials only) specified in Section 04 20 00 – Unit Masonry.

.2 Eight Thousand Dollars ($8,000.00) for Fieldstone (materials only) specified in Section 04 43 13 – Fieldstone Masonry Veneer.

.3 Thirty Dollars Per Square Yard ($30.00/SY) for Carpeting (materials only) specified in Section 09 68 00 – Carpeting.

.4 Five Hundred Dollars ($500.00) for Door Signs (materials only) specified in Section 10 14 00 – Door Signs.

.5 Ninety Six Thousand Dollars ($96,000.00) for Banking Equipment specified in Section 11 15 00 – Banking Equipment.

Add the following Subparagraph 3.15.3 to Paragraph 3.15:

3.15.3 In addition to general broom cleaning, the Contractor shall thoroughly clean all glass, remove stains, marks and dirt from painted and other decorated work; clean and polish all hardware; remove paint spots from all surfaces; clean all fixtures; wash all hard finish floors, and ensure that resilient tile floors have been cleaned and waxed in accordance with the Specifications.

ARTICLE 9: PAYMENTS AND COMPLETION:

Add the following Subparagraph 9.3.4 to Paragraph 9.3:

9.3.4 Until the Work is 50 percent complete, the Owner will pay ninety five (95) percent of the amount due the Contractor on account of progress payments. At the time the Work is 50 percent complete and thereafter, if the manner of completion of Work and its progress are and remain satisfactory to the Architect, and in the absence of other good and sufficient reasons, the Architect will (on presentation by the Contractor of Consent of Surety pay each Application) authorize any remaining partial payments to be paid in full.

.1 The full Contract retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Architect (or if the Surety withholds its consent), or for other good and sufficient reasons.

.2 The Contractor shall submit application for payment no later than the last day of the month and applications received from the Architect by the Owner by the 5th day of the month will be paid by the 15th day of the month following application for payment.

Add the following Paragraph 9.11 to Article 9:

ARTICLE 11: INSURANCE:

Add the following Clause 11.1.2.1 to Subparagraph 11.1.2:

11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following, or greater if required by law and the insurance shall be written by a company licensed to do business at the place of building:

.1 Workman's Compensation and Employer's Liability:

a. Workers' Compensation coverage shall be provided in accordance with the statutory coverage required in Alabama. A group insurer must submit a certificate of authority from the Alabama Department of Industrial Relations approving the group insurance plan. A self-insurer must submit a certificate from the Alabama Department of Industrial Relations stating the Contractor qualifies to pay its own workers' compensation claims.

b. Employer’s Liability Insurance limits shall be at least:

1) Bodily Injury by Accident - $1,000,000 each accident

2) Bodily Injury by Disease - $1,000,000 each employee

.2 Commercial General Liability Insurance:

a. Commercial General Liability Insurance, written on an ISO Occurrence Form (current edition as of the date of Advertisement for Bids) or equivalent, shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The Commercial General Liability Insurance shall provide at minimum the following limits:
   1) General Aggregate: $2,000,000.00 per Project
   2) Products, Completed Operations Aggregate: $2,000,000.00 per Project
   3) Personal and Advertising Injury: $1,000,000.00 per Occurrence
   4) Each Occurrence: $1,000,000.00

b. Additional Requirements for Commercial General Liability Insurance:
   1) The policy shall name the Owner, Architect, and their agents, consultants and employees as additional insureds, state that this coverage shall be primary insurance for the additional insureds; and contain no exclusions of the additional insureds relative to job accidents.
   2) The policy must include separate per project aggregate limits.

.3 Commercial Business Automobile Liability Insurance:

a. Commercial Business Automobile Liability Insurance which shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than $1,000,000 Combined Single Limits for each occurrence.

b. The policy shall name the Owner, Architect, and their agents, consultants, and employees as additional insureds.

.4 Commercial Umbrella Liability Insurance:

a. Commercial Umbrella Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employers' Liability to satisfy the minimum limits set forth herein.

b. Minimum Combined Primary Commercial General Liability and Commercial/Excess Umbrella Limits of:
   1) $ 5,000,000 per Occurrence
   2) $ 5,000,000 Aggregate

c. Additional Requirements for Commercial Umbrella Liability Insurance:
   1) The policy shall name the Owner, Architect, and their agents, consultants, and employees as additional insureds.
   2) The policy must be on an "occurrence" basis.

Delete Subparagraph 11.4.1 in its entirety and substitute the following:

11.4.1 The Contractor shall purchase and maintain property insurance upon the entire Work at the site to the full insurable value thereof. Such insurance shall be in a company or companies against which the Owner has no reasonable objection.

This insurance shall include the interests of the Owner, the Contractor, Sub-contractors and Sub-subcontractors in the Work and shall insure against the perils of fire and extended coverage and shall include "all risk" insurance of physical loss or damage including, without duplication of coverage, theft, vandalism and malicious mischief. If not covered under "all risk" insurance or otherwise provided in the Contract Documents, the Contractor shall effect and maintain similar property insurance on portions of the Work stored off the site or in transit when such portions of the Work are to be included in an Application for Payment under Subparagraph 9.3.2.

END OF SECTION 00 22 00

SECTION 00 42 00 – PROPOSAL FORM

Traders & Farmers Bank
Haleyville, Alabama
c/o Lambert Ezell Durham Architecture, LLC
P. O. Box 934
401 East College Street
Florence, Alabama 35631

Date:_____

Gentlemen:

We hereby submit our proposal for construction of "Branch Bank for Traders & Farmers Bank, Double Springs, Alabama" in accordance with Drawings and Specifications prepared by Lambert Ezell Durham Architecture, LLC dated November 30, 2017.

Having carefully examined all Conditions and Specifications entitled "Branch Bank for Traders & Farmers Bank, Double Springs, Alabama", dated November 30, 2017, including Addendum Numbers _____to_____inclusive, similarly entitled Contract Drawings numbered SD-1 through SD-2, L-1 through L-2, A-1 through A-15, S-1.0 through S-4.0, P-1.0 through P-4.0, M-1.0 through M-3.0, and E-1 through E-8 inclusive dated November 30, 2017; and having visited site and examined all conditions affecting Work; Undersigned proposes to furnish all labor, materials, equipment and appliances necessary and required for entire Work of Base Contract for the following Stipulated Sum:

BASE BID:

_____ Dollars ($_____).

UNIT PRICES: Should the Undersigned be required to perform work over and above that required by Contract Documents, he will be paid extra, on basis of Unit Prices quoted herein, prices quoted being sum total compensation payable or creditable for such items of work.

1. Earth Excavation:
   - General ..... $_____per cubic yard
   - In Trenches ..... $_____per cubic yard

2. Earth Backfill and Compaction:
   - General ..... $_____per cubic yard
   - In Trenches ..... $_____per cubic yard

3. Extra Concrete (in place): ..... $_____per cubic yard

4. General Rock Excavation and Disposal: ..... $_____per cubic yard

3. Flowable Fill 500 p.s.i. Concrete (in place): ..... $_____ per cubic yard

COMPLETION TIME: If Undersigned be notified of proposal acceptance within thirty (30) days after above date, he agrees to execute Contract for Work, for which Contract shall be the AIA "Standard Form of Agreement", A101-2007, Supplemented by AIA Document A201-2007, "General Conditions for the Contract for Construction," both as modified and completed by the Owner. If awarded Contract, Undersigned agrees to full completion of the work within _____ consecutive calendar days. It is understood that all periods of time stated above extend from the date of receipt of Notice to Proceed with days to be added for time lost to construction due to strikes, legal holidays, or rainy days and/or inclement weather where one-half (1/2) day or more is lost.

The Undersigned further agrees that from the compensation otherwise to be paid, the Owner may retain the six percent per annum for the total Contract Sum for each day thereafter, Sundays, and holidays included, that the Work remains incomplete, which sum is agreed upon as the proper measure of liquidated damages which the Owner will sustain per diem by the time stipulated, and this sum is not to be construed as a penalty.

BONDS: Undersigned agrees, if awarded Contract, to furnish and deliver to Architect, within fifteen (15) days after signing of Contract, satisfactory Performance Bond and Payment Bond in form currently issued by the American Institute of Architects, in amount equal to 100% of Contract Sum.

_____
(Business Name)

By: _____

_____
(Business Address)

END OF SECTION 00 42 00

SECTION 01 31 19 — PROJECT MEETINGS

PART 1 — 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. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
   1. Preconstruction conferences.
   2. Preinstallation conferences.
   3. Progress meetings.

1.3 Preconstruction Conference:

A. Schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Architect, but no later than 15 days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:
   1. Tentative construction schedule.
   2. Critical work sequencing.
   3. Designation of responsible personnel.
   4. Procedures for processing field decisions and Change Orders.
   5. Distribution of Contract Documents.
   6. Submittal of Shop Drawings, Product Data and Samples.
   7. Preparation of record documents.
   8. Use of the premises.
   9. Parking availability.
   10. Office, work and storage areas.
   11. Equipment deliveries and priorities.
   12. Safety procedures.
   13. First aid.
   14. Security.
   15. Housekeeping.
   16. Working hours.

1.4 Preinstallation Conferences:

A. Conduct a preinstallation conference at the Project Site before each construction activity that requires coordination with other construction.

B. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect of scheduled meeting dates.
C. Review the progress of other construction activities and preparations for the particular activity under consideration at each preinstallation conference, including requirements for the following:
   1. Contract Documents.
   2. Options.
   3. Related Change Orders.
   4. Purchases.
   5. Deliveries.
   6. Shop Drawings, Product Data and quality-control samples.
   7. Review of mockups.
   8. Possible conflicts.
   9. Compatibility problems.
   10. Time schedules.
   11. Weather limitations.
   12. Manufacturer's recommendations.
   13. Warranty requirements.
   14. Compatibility of materials.
   15. Acceptability of substrates.
   16. Temporary facilities.
   17. Space and access limitations.
   18. Governing regulations.
   19. Safety.
   20. Inspecting and testing requirements.
   21. Required performance results.
   22. Recording requirements.
   23. Protection.
D. Record significant discussions and agreements and disagreements of each conference, and the approved schedule. Promptly distribute the record of the meeting to everyone concerned, including the Owner and Architect.
E. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 Progress Meetings:
A. Conduct progress meetings at the Project Site on a monthly basis. Notify the Owner and the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
2. Review the present and future needs of each entity present, including the following:
    a) Interface requirements.
    b) Time.
    c) Sequences.
    d) Status of submittals.
    e) Deliveries.
    f) Off-site fabrication problems.
    g) Access.
    h) Site utilization.
    i) Temporary facilities and services.
    j) Hours of work.
    k) Hazards and risks.
    l) Housekeeping.
    m) Quality and work standards.
    n) Change Orders.
    o) Documentation of information for payment requests.

D. Reporting: No later than 3 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
    1. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 — PRODUCTS (Not Applicable)

PART 3 — EXECUTION (Not Applicable)

END OF SECTION 01 31 19

SECTION 01 33 00 — SUBMITTAL PROCEDURES

PART 1 — GENERAL

1.1 General: The provisions of this section apply to required submittals, related to units of work, not to administrative submittals including payment requests, insurance certificates and progress reports. In addition to specific provisions of General and Supplementary Conditions related to submittals, specification sections of Divisions 2 through 16 contain submittal requirements. Specific requirements in other sections have precedence over general requirements of this section.

1.2 Procedural Requirements:

A. General: Coordinate submittals with progress schedule and actual progress of the work; allow 2 weeks for Architect's/Engineer's initial processing of submittals requiring review and return. Use special transmittal form to establish complete record of submittals. Provide copies required by governing authorities that are in addition to copies specified for submittal to Architect/Engineer.

B. Copies of Shop Drawings: Initially submit 4 blue/blackline prints for approval; submit 5 when consultant approval also required. A minimum of 2 copies will be returned. After approval, submit 2 prints of corrected shop drawings to Architect for file; distribute number required for job use and distribution.

C. Copies of Product Data: Mark each copy to indicate actual product to be provided; show selections from among options in manufacturer's printed product data. Except as otherwise indicated, submittal is for information and record (not for Architect's/Engineer's approval). Submit 4 copies to Architect for review, 5 copies when consultant review also required.

D. Samples: Submit samples to Architect for approval accompanied by letter of transmittal from Contractor which includes a list of samples, name of project, Contractor, manufacturer, and brand. Sample submittals are for Architect's/ Engineer's observation of color, texture, pattern and "kind" as applicable.

E. All shop drawings and product data submittals shall have been checked, signed and dated by the Contractor prior to submittal to the Architect for approval. Submittals received without Contractor's approval will be returned to the Contractor for resubmittal.

PART 2 — PRODUCTS

NOT APPLICABLE

PART 3 — EXECUTION

NOT APPLICABLE

END OF SECTION 01 33 00

SECTION 01 50 00 — TEMPORARY FACILITIES AND CONTROLS

PART 1 — GENERAL

1.1 Field Office: Provide and maintain for the duration of the Contract a suitable temporary, weathertight field office at the site for use of the Architect, Contractor and subcontractors.

1.2 Telephone: Provide and maintain for the duration of the Contract a cellular telephone for the Superintendent's use.

1.3 Sanitary Facilities:
- A. Provide and maintain on the site for the duration of the Contract temporary toilet facilities for use of all personnel.
- B. Toilets shall be maintained in a sanitary condition and shall comply with all applicable codes and Health Department requirements.

1.4 Temporary Fencing, Barricades, Scaffolds, and Safety Devices:
- A. Provide, erect and maintain all fencing, barricades, scaffolding, staging, platforms, runways, temporary flooring, guards, railing, temporary stairs, lanterns, and safety devices, etc., as required by local, state, and federal codes or laws for the protection of workmen or the public.
- B. The construction, inspection and maintenance of the above items shall comply with all safety codes and regulations applicable to the Project.

1.5 Temporary Light and Power:
- A. Make necessary arrangements and pay all fees with utility companies required to provide all temporary light and power for the entire construction period.
- B. Each Contractor shall provide his own wiring, lighting, outlets, etc., as required to extend from the point of service to his work.
- C. The permanent installation may be used for temporary work as it becomes available.

1.6 Temporary Water Supply:
- A. Make necessary arrangements and pay all fees with utility companies as required to provide temporary water for the entire construction period. Water meter shall be of size indicated on the Drawings. If not indicated, contact Architect for meter size and location prior to installation by utility company.
- B. The Contractor shall provide any and all hose required to extend from the point of service to his work.

1.7 Cold Weather Protection and Temporary Heat:
- A. Provide for all cold weather protection, temporary heat and fuel as necessary to carry on the work expeditiously during inclement weather, to dry out the building and to provide suitable working conditions for the installation and curing of materials until final acceptance.
- B. The methods of heating and the type of fuel and equipment used are subject to the approval of the Architect.

C. After the building is completely closed, the permanent heating system may be used. The Contractor shall be responsible for use of the permanent heating system. Such use shall not relieve the Contractor of his responsibility to turn over the system to the Owner in perfect condition on completion of the Project.

1.8 Removal: Remove all temporary facilities from the premises at the completion of the Contract.

PART 2 — PRODUCTS

NOT APPLICABLE

PART 3 — EXECUTION

NOT APPLICABLE

END OF SECTION 01 50 00

SECTION 01 60 00 — PRODUCT REQUIREMENTS

PART 1 — GENERAL

1.1 General Limitations: Where possible, provide entire required quantity of each generic product, material or equipment from a single source; and, where not possible to do so, match separate procurements as closely as possible. To the extent the selection process is under Contractor's control, provide compatible products, material and equipment. Where available and complying with requirements, provide standard products which have been used previously and successfully in similar applications, and which are recommended by manufacturers for applications indicated.

1.2 Product Selection Limitation:

A. Where single products or two or more products are named, it shall be understood as descriptive of a type or style of material required; other brands or makes of equal quality and utility may be bid on, subject to Architect's written approval issued five (5) days or more before date of bid opening.

B. The phrase "or equal" referred to throughout these Specifications shall mean that written approval of such materials must be obtained from the Architect. Manufacturers desiring to submit bid for an "equal" must submit full data covering the product to the Architect in ample time to be evaluated and a written approval issued by the Architect no later than five (5) days prior to date of bid opening.

C. Compliance with Standards: Selection of product that complies with requirements, including applicable standards, is Contractor's option where no product names are indicated.

D. Performance Requirements: Selection of product that has been tested to show compliance with requirements, including indicated performances, is Contractor's option where no product names are indicated.

E. Prescriptive Requirements: Selection of product that has been certified by manufacturer to comply with requirements, including indicated performances, is Contractor's option where no product names are indicated.

PART 2 — PRODUCTS

NOT APPLICABLE

PART 3 — EXECUTION

NOT APPLICABLE

END OF SECTION 01 60 00

SECTION 01 70 00 — EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 — GENERAL

1.1 Upon completion of the Project, the Contractor will be required to furnish the following items to the Architect before approval of final payment will be made:

A. Contractor's one-year warranty on all materials, equipment and workmanship, as provided for in the General Conditions.

B. One-year warranties on all materials, equipment and workmanship from plumbing, heating/air conditioning, and electrical subcontractors, where required by the Specifications.

C. Asphalt Roofing Material Warranty Period: 40 years from date of Substantial Completion, prorated, with first 5 years non-prorated.

D. Operating and maintenance instructions for all mechanical or electrical equipment, or any other item requiring maintenance at the building. Furnish at one time in neatly bound form.

E. Evidence that all indebtedness has been paid to subcontractors and material suppliers. (Affidavits from each if requested by Architect).

F. Two (2) sets of Record Drawings and Specifications. These shall be prepared on sets in good condition, from a record set that has been kept in the field office throughout the construction period, and that has been recorded on it all deviations from the construction indicated by Contract Drawings and Specifications, at the time the change is completed.

PART 2 — PRODUCTS

NOT APPLICABLE

PART 3 — EXECUTION

NOT APPLICABLE

END OF SECTION 01 70 00

SECTION 02 32 00 — GEOTECHNICAL INVESTIGATIONS

PART 1 — 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. Copies of subsurface investigation report prepared by OMI, Inc. dated November 27, 2017 is attached with this Specification for Contractor's review, information and action as specified below.
- B. Related Work Specified Elsewhere: Section 31 10 00 - Site Clearing and Section 31 20 00 – Earth Moving.

1.3 Subsurface investigation report dated November 27, 2017, contains observations of existing conditions encountered in drill holes taken on November 15, 2017, and recommendations concerning structural design considerations. Structural engineering has been based upon conclusions reached by OMI, Inc.

PART 2 — PRODUCTS

NOT APPLICABLE

PART 3 — EXECUTION

3.1 Recommendations: Contractor is hereby directed to comply with all recommendations contained in the report.

END OF SECTION 02 32 00

OMI, Inc.

SUBSURFACE EXPLORATION AND
GEOTECHNICAL ENGINEERING STUDY
Proposed
Traders and Farmers Bank
Highway 195
Double Springs, Alabama

OMI Job No. 8175

November 27, 2017

5151 Research Drive, N.W., Suite A Huntsville, AL 35805 Tel: (256) 837-7664 Fax: (256) 837-7677 E-mail: omi@omi-eng.com

OMI, Inc.

November 27, 2017

Lambert Ezell Durham Architecture, LLC
P.O. Box 934
Florence, AL 35631

ATTN: Mr. Calvin Durham

SUBJECT: Report of Geotechnical Engineering Study
Proposed Traders and Farmers Bank
Double Springs, Alabama
OMI Job No. 8175

Gentlemen:

OMI, Inc., has completed a subsurface exploration and geotechnical engineering study for the referenced project. Enclosed is the report of the findings as well as recommendations for foundation design and construction, site preparation, and other geotechnically related site activities. This work was authorized on November 8, 2017, by Mr. Calvin Durham of Lambert Ezell Durham Architecture, LLC.

OMI, Inc., appreciates the opportunity to be of service to Lambert Ezell Durham Architecture and looks forward to continued involvement with the construction monitoring phase of this project. Please direct any questions concerning this report to the undersigned.

Respectfully submitted,

OMI, Inc.

Wes McKay, E.I.
Staff Engineer

John W. Corbell, P.E.
Senior Engineer

ALABAMA LICENSED PROFESSIONAL ENGINEER JOHN W. CORBELL

Distribution: One Copy to Addressee via E-mail: cdurham@ledarchitecture.com

5151 Research Drive, N.W., Suite A Huntsville, AL 35805 Tel: (256) 837-7664 Fax: (256) 837-7677 E-mail: omi@omi-eng.com

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Soil Boring Records
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1.0 EXECUTIVE SUMMARY

Unsuitable organic fill encountered in the southwest corner of the proposed building footprint will need to be removed and backfilled with suitable fill soil. The site will then be suitable for a typical shallow foundation system. Specific recommendations for foundation design and site earthwork are given in the body of this report.

2.0 INTRODUCTION

OMI, Inc., has completed a design geotechnical engineering study for the proposed Traders and Farmers Bank in Double Springs, Alabama. This report outlines the scope of services provided and presents comments and recommendations based on professional opinions formed during the course of this study. This work was authorized on November 8, 2017, by Mr. Calvin Durham of Lambert Ezell Durham Architecture . The work was performed in general accordance with OMI Proposal No. P-5084.

Assessment of the environmental aspects of this site, including previous land use or the determination of the presence of any chemical, industrial, or hazardous waste is beyond the scope of this study. However, OMI can provide these services if desired.

3.0 EXPLORATION METHODS

The procedures used by OMI for field and laboratory testing are in general accordance with ASTM procedures and established engineering practice. Brief descriptions of the procedures used in this exploration are contained in the Appendix of this report.

Four soil test borings were drilled to auger refusal in the proposed building area. Three borings were drilled to 5-ft each in parking areas. Boring locations are shown on the appended Boring Location Map. A member of the OMI professional staff directed the drilling and logged the soils in

the field. Samples were taken using a manual safety hammer using a rope and cathead. Subsequently, each sample was sealed and transported to the office. Selected samples were tested to determine the natural moisture content of the soil. These tests assist in confirming the visual classifications as well as provide an index of certain engineering properties. The soil classifications, field testing data, and the results of the laboratory tests are provided on the Soil Boring Records in the Appendix of this report.

4.0 SITE CONDITIONS

The site for the proposed Traders and Farmers Bank is a rectangular parcel about half an acre in size and is located on the southeast corner of Highway 195 and Blake Drive in Double Springs. Highway 195 extends along the west property edge while Blake Drive extends along the north edge. Main street extends along the eastern edge while an existing single-story bank surrounded by concrete parking borders the property to the south. The concrete parking lot is separated from the subject property by a brick retaining wall and is about 3-ft above the subject site's existing grade.

The site was previously-occupied by a bank with an attached service station and was surrounded by asphalt and concrete parking. The site has recently been cleared and is now a bare, open lot. Surface drainage flows to the west at slopes ranging from 1 to 5 percent. A bronze civil war monument surrounded by concrete sidewalks and mowed landscaping is located in the northern end of the site. A PVC cleanout and new gas line termination is located in the middle of the southern end of the lot.

5.0 SUBSURFACE CONDITIONS

Subsurface conditions were fairly typical when compared to similar sites in the area. Fill soils of varying quality overlaying residual sands were encountered across the site.

The sandy fill was generally limited to the upper 2-ft except for Boring B-3, which contained an organic, dark grey, sandy silty soil to 5.5-ft deep. Moisture contents in the fill layers ranged from 10 to 15 percent and averaged 12 percent. SPT (Standard Penetration Test) values ranged from 6 to 20 bpf (blows per foot) and averaged 12 bpf. Pocket penetrometer values averaged 1.25 tsf (tons per square foot).

The underlying residual, sandy soils were encountered to refusal or termination depths as noted in the Boring Records. Moisture contents ranged from 7 to 18 percent and averaged 13 percent. SPT values ranged from 9 to more than 100 bpf and generally averaged 16 bpf. Pocket penetrometer values averaged 1.25 tsf.

Auger refusal was encountered in the building area borings to depths ranging from 6 to 8.5-ft. Auger refusal is presumed to be sandstone bedrock, but can be the result of boulders or pinnacles.

No groundwater was encountered during drilling. Extended water readings were not taken. Because of the geology of this region, the groundwater levels are generally a function of seasonal precipitation and locally heavy rainfall events. Consequently, the groundwater levels can and do fluctuate with time.

6.0 SITE GEOLOGY

Pottsville Formation

The lower part of the Pottsville Formation occurs in the vicinity of the site. The formation is several hundred feet thick and consists of sandstone, shale, and coal. The sandstone is composed of fine to coarse-grained quartzitic sand with some quartz pebble conglomerate near the base of the formation. The shale is a sandy, often fossiliferous, shale, generally gray to brown, and is interbedded with sandstone below the coal seams. Soils derived from the Pottsville Formation are generally a combination of silty clay or sandy silty clay near the surface. The soils transition to layered sandy silty clay and silty clay between thin layers of sandstone.

7.0 PROJECT INFORMATION

Based on information provided by the client, OMI expects the proposed construction to be a single-story, light-duty commercial structure with stud-framing and a brick veneer. Column loads are not expected to exceed 100 kips while wall loads are not expected to exceed 2 klf (kips per linear foot). Floor loads of up to 100 psf are assumed.

A finished floor elevation of 822.00 is noted on plans provided by Lambert Ezell Durham Architecture. Based on the existing site conditions, OMI expects roughly 2 to 3-ft of fill will be needed across the building pad. Two separate paved areas are planned, one in the north end and one in the south end. Both pavement areas will be accessed from Main Street.

8.0 BASIS FOR RECOMMENDATIONS

The following recommendations are based in part on the preceding project information. This study has utilized the subsurface data, historical information regarding the structural performance of similar structures, and past experience with similar geologic environments to develop professional opinions on which the recommendations are based. Because the structural elements of the design greatly influence the design recommendations, OMI must be provided the opportunity to review the following comments and recommendations in light of changes in building location, elevation, or structural loading.

Standard practice in geotechnical engineering is that all but a few special structures will tolerate 1-in of settlement. Therefore, 1-in is assumed acceptable. Unless otherwise stated, the recommendations in this report are intended to keep post-construction settlement to less than 1-in.

9.0 DESIGN RECOMMENDATIONS

9.1 Foundation Design

Provided the site is prepared in accordance with the recommendations contained in this text, the proposed structure may be supported by a conventional shallow foundation system bearing on the in-place soil or engineered fill as applicable. Footings should be designed based on a maximum allowable bearing pressure of 3000 psf for individual column footings and 2500 psf for continuous footings. These pressures include a factor of safety of at least three against general shear failure. To allow for minor inconsistencies in the soil subgrade, individual and continuous footings should have minimum widths of 24-in and 18-in, respectively, regardless of loading. Footings should bear at least 2-ft below grade to provide adequate confinement and protection against frost. The ground surface around the building area should be graded to provide positive drainage away from the building.

9.2 Seismic Classification

OMI has reviewed the soils at the site with respect to the criteria for seismic classification. In accordance with Section 1615.1, Table 1615.1.1 of the 2003 International Building Code, OMI judges the soil to be Site Class C.

9.3 Floor Slabs

The slab thickness, reinforcing, and stone base thickness are all a function of the traffic weight, loading frequency, and the soil subgrade strength. A typically loaded light commercial floor slab, where the design floor loads are less than 100 psf, should be placed on a 4-in thick layer of open-graded compacted gravel. The aggregate layer will distribute the floor load from the slab to the soil and provide protection against the migration of moisture upward through the floor slab. A vapor barrier may be placed beneath the floor slab stone to provide additional protection against moisture migration.

9.4 Fill Soils

Fill soils should be soils free of organics, deleterious debris, or rocks larger than 3-in in diameter. The soil should have a plasticity index (PI) of less than 25 and a maximum dry density of at least

100 pcf as determined by the standard Proctor (ASTM D698). The fill should be compacted to at least 95 percent of the soil's standard Proctor maximum dry density, SPMDD. The top 1-ft beneath the building and pavement areas should be compacted to 100 percent SPMDD. The on-site soil interval meets the guideline set forth above.

9.5 Pavement Areas

Surface parking and entrance drive areas should be prepared in accordance with the general recommendations for stripping and fill placement stated elsewhere in this text, except the upper 1-ft must be compacted to at least 100 percent of the standard Proctor maximum dry density. The pavement section provided was based on a CBR of 6. Specific traffic frequency and loading information has not been provided; however, assuming that the paved areas can be broken into two categories with the listed frequencies and loading being acceptable, the following pavement sections may be used.

AUTOMOBILE PARKING - Maximum 1000 vehicles per day (VPD) consisting of automobile traffic and no more than 10 medium trucks (6 kips per axle) per day. No heavy trucks.

TRUCK PARKING/DOCKS - Maximum 3000 VPD including not more than 2 heavy trucks per day.

FLEXIBLE PAVEMENT DESIGN

PAVEMENT MATERIAL	AUTOMOBILE	TRUCK
ASPHALT SURFACE COURSE (Hot Mix) ALDOT No. 424A, 1/2-in Max. Agg. Size, ESAL Range A/B	2.0 inches	1.5 inches
ASPHALT BINDER COURSE ALDOT No. 424B, ¾-in Max. Agg. Size, ESAL Range A/B	—	2.0 inches
STONE BASE COURSE ALDOT No. 825 B (Compacted to 100% Standard Proctor as per AASHTO T-99)	6.0 inches	6.0 inches
TOTAL THICKNESS	8.0 inches	9.5 inches

All pavement materials and construction methods should conform to the guidelines and requirements of the Alabama Department of Transportation. During placement of the aggregate base and asphalt courses, density tests and thickness measurements should be performed to compare the design section to the constructed section. The soil subgrade should be graded to provide a smooth transition from one pavement section to another. It is imperative that truck traffic be limited to areas specifically designed to carry those vehicles.

Immediately prior to placement of the aggregate base, the subgrade must be proofrolled to judge the stability of the soil. The soil may require recompaction. The stone base course should only be applied to a stable, compact soil subgrade. Asphalt paving should proceed closely after stone placement. If lengthy delays between stone and asphalt paving occur, the stability of the stone and soil subgrade should be checked prior to paving.

Rigid pavement should be specified for areas that will be used for the storage of refuse bins and the operation of waste removal vehicles.

10.0 CONSTRUCTION CONSIDERATIONS

10.1 Site Preparation

Topsoil has already been stripped across the site. To prepare the site for construction, all abandoned utilities should be removed. Undercutting of the southwest building corner should then begin as discussed later. Subsequently, the areas approximately at grade or to receive fill should be checked by the geotechnical engineer. Proofrolling may be elected to be used to check stability. Proofrolling is performed by repeated passes of a heavy rubber-tired vehicle, such as a loaded dump truck. Any areas judged to deflect excessively during proofrolling should be undercut to a stable soil horizon. Such over-excavation must be backfilled with structural fill placed as described below. Upon reaching subgrade elevation in cut areas, the exposed soil subgrade should be similarly proofrolled and repaired.

10.2 Estimated Soil Undercut

The organic fill soils found in the area of Boring B-3 will need to be removed by undercutting until residual soils are encountered. This over-excavation should extend at least 10-ft outside the building perimeter as applicable. OMI expects undercutting to extend about 5 to 6-ft.

For this reason, OMI recommends the construction budget include an allowance of 300 cubic yards (in-place volume) for undercut and replacement of these soft, unsuitable soils. The construction documents should state that this contingent undercut will be paid on a per-yard basis as authorized by the geotechnical engineer under contract to the owner. Any unused contingency costs will be kept by the owner.

Before fill is placed, the geotechnical engineer must be allowed to profile the undercut areas in order to determine the volume of undercut. Backfilling may then begin.

10.3 Fill Placement

Once undercutting has been performed and all areas have been checked by the geotechnical engineer, placement of structural fill may begin. Specific requirements of the soil properties are discussed previously. The soil should be placed in loose lifts, not exceeding 8-in in thickness, and systematically compacted to at least 95 percent of the soil's standard Proctor maximum dry density (ASTM D698) except the top 1-ft should be compacted to 100 percent SPMDD.

10.4 Density Testing

Field density testing should be performed on each lift prior to placement of additional lifts. Test locations should be evenly distributed throughout the fill area and should be performed at the frequencies shown on the following table.

AREA	METHOD OF PLACEMENT AND COMPACTION	INITIAL TEST FREQUENCY	RETEST FREQUENCY
General Site	Large self-propelled equipment	1 test per 5000-ft^2, minimum 3 tests per lift	1 test per failed test
Isolated Areas	Hand-guided equipment	1 test per lift	1 test per failed test
Trench backfill and behind retaining walls	Hand-guided equipment	1 test per 50 linear feet per 6-in of fill	1 test per failed test

Test frequencies may be increased during the early stages of earthwork construction. Compaction requirements should apply to all exca vation/backfill operations conducted on the proposed development property.

10.5 Footing Observations

The footing excavation process generates a disturbed layer of soft soil in the excavation bottoms. This soft compressible layer should be removed prior to placement of concrete. Each foundation excavation should be observed by the geotechnical engineer to check for local variations in the soil strength as well as the removal of the disturbed layer.

10.6 Foundation Construction

The foundations should be excavated, hand cleaned, checked, and concrete placed as expeditiously as possible. Exposing soils to excessive wetting or drying during construction can cause problems such as heaving or settlement due to shrinking and swelling of the clay particles in the soil. Footing excavations that will be left open for more than 8 hours should be covered for protection.

10.7 Construction Monitoring

The foundation and site preparation recommendations contained in this report are based on the conditions encountered during the subsurface exploration and past experience in this geologic setting. Because subsurface conditions may vary from the anticipated, it is important to have a well-rounded quality control program. Construction monitoring on a project of this nature can serve as an economical means to achieve the best possible foundation system and reduce the potential for

future problems. OMI, Inc., strongly recommends that all construction monitoring be performed under contract with the Owner or the Owner's representative.

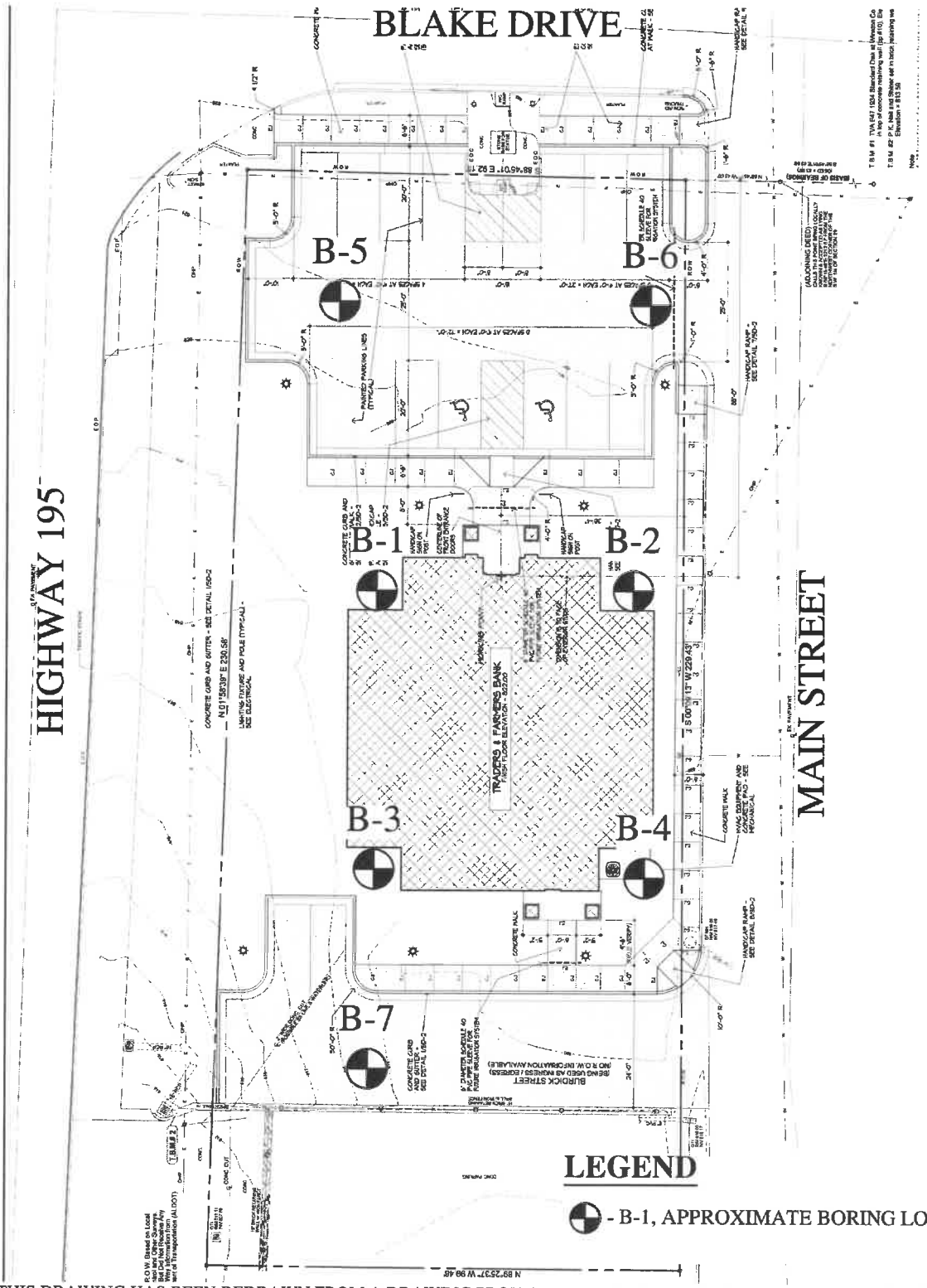
APPENDICES

OMI, Inc.

5151 Research Dr. NW
Huntsville, AL 35805

PH: (256) 837 - 7664

FAX: (256) 837 - 7677



NOTE: THIS DRAWING HAS BEEN REDRAWN FROM A DRAWING PROVIDED BY: LAMBERT, EZELL, DURHAM ARCHITECTURE, LLC., FLORENCE, ALABAMA.

JOB NAME: TRADERS AND FARMERS BANK HIGHWAY 195 DOUBLE SPRINGS, ALABAMA	BORING LOCATION MAP DRAWING NO: 8175 - 1	JOB N0: 8175 DATE: 11-27-2017 SCALE: 1"= 40' DRAWN BY: DAH

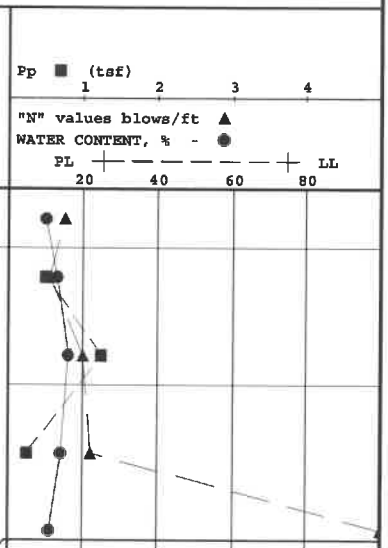
OMI, Inc.

5151 Research Drive, N.W. Huntsville, AL 35805

JOB NO.: 8175 JOB: Traders and Farmers Bank LOG OF BORING: B-1

JOB LOCATION: Double Springs, AL BORING LOCATION:

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	NATURAL MOISTURE	POCKET PENT TSF
			Elevation=			
0			CLAYEY SAND with gravel, 15% coarse to fine gravel, 60% fines, 25% fines, low plasticity, tan, very stiff, moist, FILL, SC	15	10	--
				11	13	0.5
5			CLAYEY SAND, 60% fine sand, 40% fines, low plasticity, orange and tan, stiff to very stiff, moist, residuum, SC	20	16	1.25
				22	14	0.25
				100+	11	--
10			AUGER REFUSAL @ 8.5-FT			
15						
20						
25						
30						
35						
40						



COMPLETION DEPTH: 9 DEPTH TO WATERINITIAL: Dry OMI,Inc.

DATE: 11-15-17 DEPTH TO WATERFINAL:

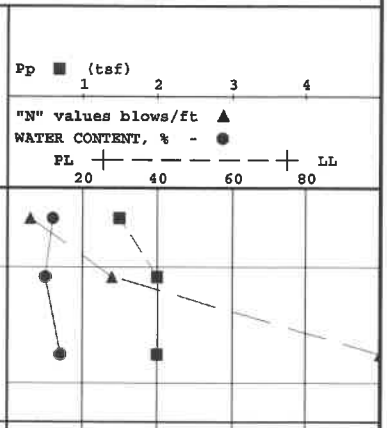
OMI, Inc.

5151 Research Drive, N.W. Huntsville, AL 35805

JOB NO.: 8175 JOB: Traders and Farmers Bank LOG OF BORING: B-2

JOB LOCATION: Double Springs, AL BORING LOCATION:

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	NATURAL MOISTURE	POCKET PENT TSF
			Elevation=			
0			CLAYEY SAND with gravel, 15% coarse to fine gravel, 60% fines, 25% fines, low plasticity, tan, firm, moist, FILL, SC	6	12	1.5
				28	10	2.0
5			CLAYEY SAND, 60% fine sand, 40% fines, low plasticity, orange and tan, very stiff to hard, moist, residuum, SC	100+	14	2.0
			AUGER REFUSAL @ 6-FT			
10						
15						
20						
25						
30						
35						
40						



COMPLETION DEPTH: 6 DEPTH TO WATERINITIAL: Dry OMI,Inc.

DATE: 11-15-17 DEPTH TO WATERFINAL:

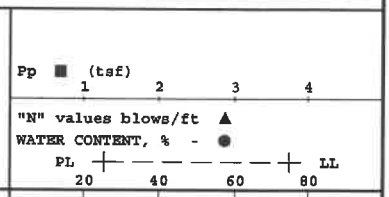
OMI, Inc.

5151 Research Drive, N.W. Huntsville, AL 35805

JOB NO.: 8175 JOB: Traders and Farmers Bank LOG OF BORING: B-3

JOB LOCATION: Double Springs, AL BORING LOCATION:

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	NATURAL MOISTURE	POCKET PENT TSF
			Elevation=			
0			CLAYEY SAND, 60% fine sand, 40% fines, low plasticity, orange and tan, firm, moist, FILL, SC	6	15	--
				20	11	0.25
5			CLAYEY SAND, 60% fine sand, 40% fines, low plasticity, orange and tan, very stiff, moist, FILL, SC	17	15	--
			SANDY SILTY with organics, 40% fine sand, 60% fines, low plasticity, dark gray, very stiff, moist, FILL, ML	24	12	1.0
10			CLAYEY SAND, 60% fine sand, 40% fines, low plasticity, orange and tan, very stiff, moist, residuum, SC			
			AUGER REFUSAL @ 8-FT			
15						
20						
25						
30						
35						
40						



COMPLETION DEPTH: 8 DEPTH TO WATERINITIAL: Dry OMI,Inc.

DATE: 11-15-17 DEPTH TO WATERFINAL:

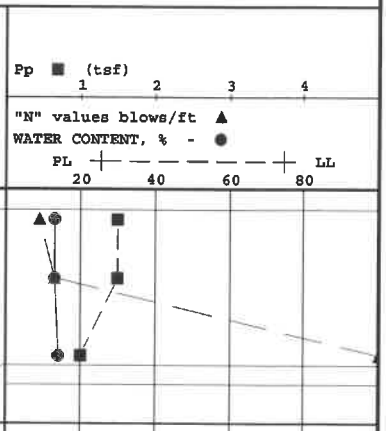
OMI, Inc.

5151 Research Drive, N.W. Huntsville, AL 35805

JOB NO.: 8175 JOB: Traders and Farmers Bank LOG OF BORING: B-4

JOB LOCATION: Double Springs, AL BORING LOCATION:

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	NATURAL MOISTURE	POCKET PENT TSF
			Elevation=			
0			CLAYEY SAND with gravel, 15% coarse to fine gravel, 60% fines, 25% fines, low plasticity, tan, stiff, moist, FILL, SC	9	13	1.5
				13	13	1.5
			CLAYEY SAND, 60% fine sand, 40% fines, low plasticity, orange and tan, stiff, moist, residuum, SC	100+	14	1.0
5						
			CLAYEY SAND, 60% fine sand, 40% fines, low plasticity, orange and tan, hard, moist, residuum, SC			
			AUGER REFUSAL @ 6-FT			
10						
15						
20						
25						
30						
35						
40						



COMPLETION DEPTH: 6 DEPTH TO WATERINITIAL: Dry OMI,Inc.

DATE: 11-15-17 DEPTH TO WATERFINAL:

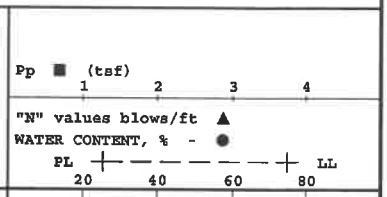
OMI, Inc.

5151 Research Drive, N.W. Huntsville, AL 35805

JOB NO.: 8175 JOB: Traders and Farmers Bank LOG OF BORING: B-5

JOB LOCATION: Double Springs, AL BORING LOCATION:

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	NATURAL MOISTURE	POCKET PENT TSF
			Elevation=			
0			CLAYEY SAND with gravel, 15% coarse to fine gravel, 60% fines, 25% fines, low plasticity, tan, stiff, moist, FILL, SC	10	7	--
				11	12	0.25
			CLAYEY SAND, 60% fine sand, 40% fines, trace gravel, low plasticity, orange and tan, stiff, moist, residuum, SC	15	11	--
5			BORING TERMINATED @ 5-FT			
10						
15						
20						
25						
30						
35						
40						



COMPLETION DEPTH: 5 DEPTH TO WATERINITIAL: Dry OMI,Inc.

DATE: 11-15-17 DEPTH TO WATERFINAL:

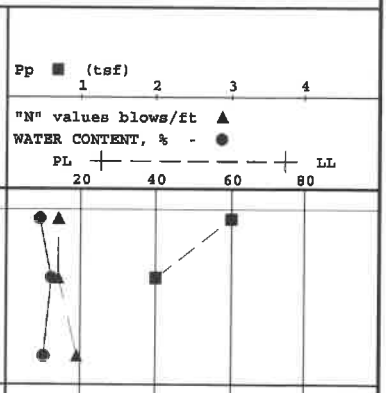
OMI, Inc.

5151 Research Drive, N.W. Huntsville, AL 35805

JOB NO.: 8175 JOB: Traders and Farmers Bank LOG OF BORING: B-6

JOB LOCATION: Double Springs, AL BORING LOCATION:

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	NATURAL MOISTURE	POCKET PENT TSF
			Elevation=			
0			CLAYEY SAND with gravel, 15% coarse to fine gravel, 60% fines, 25% fines, low plasticity, tan, very stiff, moist, FILL, SC	14	9	3.0
				14	12	2.0
5			CLAYEY SAND, 60% fine sand, 40% fines, low plasticity, orange and tan, very stiff, moist, residuum, SC	19	10	--
			BORING TERMINATED @ 5-FT			
10						
15						
20						
25						
30						
35						
40						



COMPLETION DEPTH: 5 DEPTH TO WATERINITIAL: Dry OMI,Inc.

DATE: 11-15-17 DEPTH TO WATERFINAL:

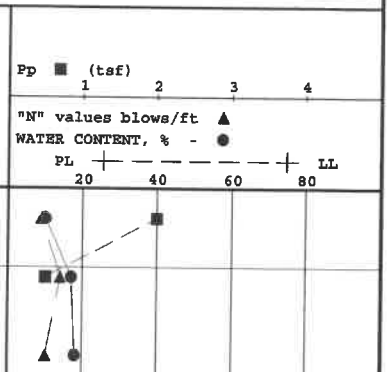
OMI, Inc.

5151 Research Drive, N.W. Huntsville, AL 35805

JOB NO.: 8175 JOB: Traders and Farmers Bank LOG OF BORING: B-7

JOB LOCATION: Double Springs, AL BORING LOCATION:

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	NATURAL MOISTURE	POCKET PENT TSF
			Elevation=			
0			CLAYEY SAND with gravel, 15% coarse to fine gravel, 60% fines, 25% fines, low plasticity, tan, firm to stiff, moist, FILL, SC	9	10	2.0
				14	17	0.5
			CLAYEY SAND, 60% fine sand, 40% fines, low plasticity, orange and tan, stiff, moist, residuum, SC	10	18	--
5			BORING TERMINATED @ 5-FT			
10						
15						
20						
25						
30						
35						
40						



COMPLETION DEPTH: 5 DEPTH TO WATERINITIAL: Dry OMI,Inc.

DATE: 11-15-17 DEPTH TO WATERFINAL:

BORING LEGEND

SOIL SYMBOLS

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAIN SOILS — MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVELS — 50% OR MORE OF COARSE FRACTION RETAINED ON #4 SIEVE	CLEAN GRAVELS	GW	WELL-GRADED GRAVELS AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS — MORE THAN 50% OF COARSE FRACTION PASSES #4 SIEVE	CLEAN SANDS	SW	WELL-GRADED SANDS AND GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS AND GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAIN SOILS — 50% OR MORE PASSES NO. 200 SIEVE	SILTS AND CLAYS — LIQUID LIMIT 50% OR LESS		ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS
			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 SANDS OR SILTS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS

ABBREVIATIONS:

SS- SPLIT SPOON SAMPLE

UD- UNDISTURBED SAMPLE

REC-SAMPLE RECOVERY

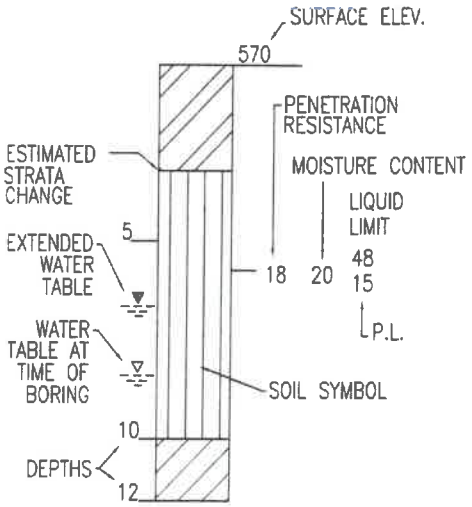
USC-VISUAL UNIFIED SOIL CLASSIFICATION

POCKET PENET- POCKET PENETROMETER READING, TSF

RQD-ROCK QUALITY DESIGNATION

FF- FRACTURE FREQUENCY PER FOOT OF CORE

KEY TO BORING RECORDS OR PROFILES



ROCK SYMBOLS

SANDSTONE

SHALE

GNEISS OR SCHIST

CONGLOMERATE

LIMESTONE OR DOLOMITE

OMI, INC.

5151 Research Drive
Huntsville, AL 35805

FIELD TEST PROCEDURES

OMI, Inc., generally follows field and laboratory testing procedures as outlined by the American Society for Testing and Materials (ASTM) and the U. S. Army Corps of Engineers. Field procedures are outlined and an overview description is provided in ASTM Standard D-420, "Standard Guide to Site Characterization for Engineering, Design, and Construction Purposes." This document is a guide to the selection of various standards for investigating soil, rock, and ground water for earth related construction. Applicable procedures include geophysical, in-situ, and boring methods. A summary of each procedure used during this study is presented below.

SOIL DRILLING PROCEDURES

Several techniques are used to advance borings for collection of soil, rock, or ground water samples. Different techniques are used, depending on the samples desired and the soil and water conditions. Depths for sample intervals, strata changes, and boring termination or refusal are recorded to the nearest 1/10 of a foot. The project utilized the following.

Soil Borings

A) Solid stem continuous flight augers (ASTM D-1452)

B) Hollow stem continuous flight augers (ASTM D-1452)

C) Rotary drilling techniques using roller cone bits or drag bits and water with or without drilling mud or other additives to flush the hole

D) Hand augers

E) Backhoes or other excavating equipment.

Rock Borings

A) Core borings with diamond bits with double or triple core barrels (ASTM D-2113)

B) Rock borings with roller cone bit

C) Rotary hammer drilling.

Hollow and Solid Stem Auger: An auger is a center post with a continuous spiral flange wrapped around it. The post is called the stem. Augers are usually constructed in 5-foot long sections that can be coupled together. As the auger is turned and advanced into the ground; the soil "cuttings" are brought to the surface. Solid stem augers have a solid core and have to be removed from the boring to allow access for sampling tools. Hollow stem augers have the spiral flange connected to a hollow tube (stem). Sampling tools can access the bottom of the boring without removing the augers from the hole.

Rotary Borings: Rotary drilling involves the use of roller cone or drag type drill bits attached to the end of hollow drill rods. A flushing medium, normally water or bentonite slurry, is pumped through the rods to clear the cuttings from the bit face and flush them to the surface. Casing is sometimes set behind the advancing bit to prevent the hole from collapsing and to restrict the penetration of the drilling fluid into the surrounding soils. Cuttings returned to the surface by the drilling fluid are usually collected in a settling tank to allow the fluid to be re-circulated.

Hand Auger Borings: Hand auger borings are advanced by manually twisting a 4-inch diameter steel bucket auger into the ground and withdrawing it when filled to observe the sample collected. Other equipment such as post-hole diggers is sometimes used in lieu of augers to obtain shallow soil samples. Occasionally, these hand auger borings are used for driving 3-inch diameter steel tubes to obtain intact soil samples.

Test Pits: A backhoe or other construction equipment is sometimes used to excavate into soils to observe the soil and collect samples.

Core Drilling: Soil drilling methods are not normally capable of penetrating through hard cemented soil, weathered rock, coarse gravel or boulders, thin rock seams, or sound continuous rock. Material which cannot be penetrated by auger or rotary soil drilling methods at a reasonable rate is designated as "refusal material." Core drilling procedures are required to penetrate and sample refusal materials.

Prior to coring, casing may be set in the drilled hole through the overburden soils to keep the hole from caving and to prevent excessive water loss. The refusal materials are then cored according to ASTM D-2113 using a diamond bit fastened to the end of a hollow, double, or triple tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core is brought to the surface, recovery is measured, and the core is sequentially placed in boxes and transported to our laboratory for review and storage.

SAMPLING AND TESTING IN BOREHOLES

Several techniques are used to obtain samples and data in soils; however, the following methods were utilized in this project:

A) Standard Penetration Testing
B) Undisturbed Sampling
C) Dynamic Cone Penetration Testing
D) Pocket Penetrometer Testing
E) Hand-Held Static Cone Penetrometer
F) Water Level Readings.

These procedures are presented below. Any additional testing techniques employed during this exploration are contained in other sections of the Appendix.

Standard Penetration Testing: At regular intervals, the drilling tools are removed and soil samples are obtained with a standard 2-inch diameter split tube or "split spoon" sampler connected to a drill rod. The sampler is first seated 6 inches to penetrate any loose cuttings then driven an additional 12 inches with blows of a 140 pound safety hammer falling 30 inches. Generally, the number of hammer blows required to drive the sampler the final 12 inches is designated the "penetration resistance" or "N" value, defined in blows per foot (bpf). The split spoon sampler is designed to retain the soil penetrated so it may be returned to the surface for observation. Representative portions of the soil samples obtained from each split spoon sample are placed in jars, sealed, and transported to the laboratory.

The standard penetration test, when properly evaluated, provides an indication of the soil strength and compressibility. The tests are conducted according to ASTM Standard D-1586. The depths and N-values of standard penetration tests are shown on the Boring Records. Split spoon samples are suitable for visual observation and classification tests, but generally are not sufficiently intact for quantitative laboratory testing.

Undisturbed Sampling: Relatively undisturbed samples are obtained by pushing 3 inch outside diameter (OD), 30 inch long steel tubes with hydraulic pressure supplied by the drill rig into the soil at the desired sampling levels (ASTM Standard D-1587). These tubes are also known as Shelby tubes. Each tube, together with the encased soil, is removed from the ground, sealed, and transported to the laboratory. Locations and depths of undisturbed samples are shown on the Boring Records.

Dynamic Cone Penetrometer: The dynamic cone is a hand-operated penetrometer used in hand auger borings and observation pits. This test is intended to provide data that can be correlated to the standard penetration test. A 1.5-inch OD cone is seated to penetrate any loose cuttings, and then driven for 3 intervals of 1.75 inch with blows from a 15-pound weight falling 20 inches. The average number of blows required to drive the cone over 1 increment is an index to soil strength and compressibility.

Pocket Penetrometer Testing: The pocket penetrometer is a hand operated penetrometer used in test pits and on split spoon and undisturbed samples. This test is intended to provide data that can be correlated to the unconfined compressive strength test. A ¼-in diameter shaft is pressed into the soil ¼-in deep. The shaft pushes against a spring with a constant of 12 pounds per inch to provide a compressive strength value in tons per square foot. The penetrometer is capable of providing readings between 0.25 tons per square foot and 4.5 tons per square foot.

Water Level Readings: Water table readings are normally taken in the borings and are recorded on the Boring Records. In sandy soils, these readings indicate the approximate location of the hydrostatic water table at the time of the field exploration. In clayey soils, the rate of water seepage into the borings is low and it is generally not possible to establish the location of the hydrostatic water table through short-term water level readings. Also, fluctuation in the water table should be expected with variations in precipitation, surface run-off, evaporation, and other factors. For long-term monitoring of water levels, it is necessary to install piezometers.

The water level reported on the Boring Records is determined by field crews immediately after the drilling tools are removed, and again several hours after the borings are completed, if possible. The time lag is

intended to permit stabilization of the ground water table which may have been disrupted by the drilling operation.

Occasionally, the borings will cave in, preventing water level readings from being obtained or trapping drilling water above the cave-in zone. The cave-in depth is measured and recorded on the Boring Records.

BORING RECORDS

The subsurface conditions encountered during drilling are reported on a Boring Record. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of coarse gravel, cobbles, etc., and observations of ground water. It also contains the driller's and the geotechnical engineer's interpretation of soil conditions between samples. Therefore, these boring records contain both factual and interpretative information. A geotechnical engineer visually classifies the soil samples and prepares the Boring Records which are the basis for all evaluations and recommendations.

LABORATORY TEST PROCEDURES

OMI, Inc., generally follows laboratory testing procedures as outlined by the American Society for Testing and Materials (ASTM), the U. S. Army Corps of Engineers, and other applicable procedures. All work is initiated and supervised by qualified engineers. Laboratory tests are performed by technicians trained to perform the work according to the appropriate procedures. The equipment is well maintained and inspected and calibrated annually or as specified by ASTM.

A description of the procedures used during this exploration or study are included in this Appendix.

SOIL CLASSIFICATION

Classification of soils provides a record and general guide to the engineering properties of the soils encountered during this study. Samples obtained during the field testing (drilling) operations are visually examined and classified by the geotechnical engineer. OMI, Inc., generally follows ASTM procedure No. D-2488 "Visual-Manual Procedure for Classifying Soils." Soil consistency and relative density is based on the number of blows from the standard penetration test. Representative or special samples are then selected for laboratory testing. Soil Boring Records are developed which present the data from the field testing as well as the soil description, water level information, and other data.

MOISTURE CONTENT

Moisture content values, when used in conjunction with other data, can be a useful and inexpensive tool to the engineer as an indicator of the engineering characteristics and parameters of the soil when compared to other data. Moisture content is performed by weighing a moist sample, drying, then re-weighing the dry sample. The moisture content is expressed as a percent of the dry weight of the soil. ASTM Method D-2216 is used to determine the moisture content of soil.

ATTERBERG LIMITS

Atterberg limits include the liquid limit (LL), plastic limit (PL), and shrinkage limit (SL) tests. These tests are performed to aid in the classification of soils and to determine the plasticity and volume change characteristics of the soil. The liquid limit is the minimum moisture content at which the soil will flow as a heavy viscous fluid. The plastic limit is the minimum moisture content at which the soil behaves as a plastic material. The shrinkage limit is the moisture content below which no further volume change will occur with continued drying. The plasticity index (PI) is the difference between the liquid limit and the plastic limit. The PI is the range of moisture at which the soil remains plastic. Many engineering characteristics have been correlated to the Atterberg limits. These are ASTM procedures D-4318, D-4943, and D-427.

STANDARD PROCTOR COMPACTION TEST

This test is used to establish a curve that predicts the effect of moisture and compactive effort on the dry density of the soil sample. It is useful as a comparative value in monitoring contractors' efforts during fill placement and compaction during construction. Also, correlations of engineering parameters such as strength, compressibility, and permeability are related to the percent compaction and soil type.

A representative sample of the proposed fill material (soil or stone) is collected. The sample is divided into four or more samples. Each sample is then brought to a different moisture content about 2% apart. Each sample is then placed in a standard 4-inch diameter mold in 3 equal layers with each layer being compacted with 25 blows from a 5.5-pound hammer falling 12 inches. The sample is trimmed to a known volume of 1/30 cubic foot then weighed. The moisture content of the sample is determined and the dry density is calculated. A graph of dry density (pcf) versus moisture content is developed. The maximum density and its corresponding moisture content known as the optimum moisture content are derived from the curve. A graph of the moisture-density relationship is given in the Appendix. ASTM D-698 describes the procedure.

UNCONFINED COMPRESSION TESTS - ROCK CORES

The strength of rock is important in many engineering applications. This strength is usually desired and reported as the unconfined or simple shear strength. Selected samples of rock cores are cut using a diamond saw. The cores are usually cut to a length equal to about twice the core diameter. The capped length and diameter of each core is measured and recorded. The cores are then loaded to failure in a compression machine. The unconfined compressive strength is calculated by dividing the cross-sectional area of the core

into the maximum load required to crush the sample. If the length to diameter ratio is less than 2.0, then the maximum strength is adjusted mathematically. The results are reported in psi. This procedure is similar to ASTM D-2938.

CONSOLIDATION TESTING

The consolidation test provides data for estimating the settlement and time rate of settlement of the soil in response to the applied loads. Representative soil samples are collected from undisturbed samples, trimmed into a disk about 2.5 inches in diameter and 1 inch thick, then placed in the consolidometer. The disk is confined in a brass ring and sandwiched by porous stones on the top and bottom. The sample ring and stones are placed in a testing device, inundated, then loaded in increments. The sample height is measured as each load caused it to compress. The resulting loads and deformations are reduced to a graph which is presented in the Appendix. These results may be presented in load versus percent strain or load versus void ration. This procedure is described in ASTM D-2435.

SECTION 03 30 00 — CAST-IN-PLACE CONCRETE

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of all cast-in-place concrete work indicated on Drawings and specified herein.

1.3 Quality Assurance:

A. Codes and Standards: ACI 301 "Specifications for Structural Concrete Buildings", ACI 318, "Building Code Requirements for Reinforced Concrete"; comply with applicable provision except as otherwise indicated.

B. Concrete Testing Service: Engage a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.

C. Quality Control: Perform Sampling and testing during concrete placement, as follows:

1. Slump: ASTM C 143, one test for each load at point of discharge.
2. Compressive Strength: ASTM C 39, one set for each 50 cu. yds., or fraction thereof for each class of concrete. One specimen at 7 days, two specimens at 28 days, and one retained for later testing if required. When the total quantity of a given class of concrete is less than 50 cu. yds., strength tests may be waived by Architect if field experience indicates evidence of satisfactory strength.

1.4 Submittals:

A. Design Mixes: For each concrete mix, include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

B. Submit reinforcement shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures.

1.5 Project Conditions:

A. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing.

B. Protect adjacent finish materials against splatter during concrete placement.

1.6 Delivery, Storage and Handling:

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 — PRODUCTS

2.1 Form Materials:

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal framed plywood faced or other acceptable panel type surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection. Use plywood conforming with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill oiled and edge sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces that will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal.

2.2 Reinforcing Materials:

A. Reinforcing Bars (ReBar): ASTM A 615, Grade 60, deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Welded Wire Fabric (WWF): ANSI/ASTM A 185, welded steel wire fabric.

D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise acceptable.

2.3 Concrete Materials:

A. Portland Cement: ASTM C 150, Type I, unless otherwise acceptable to Architect. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Fly Ash: ASTM C 618, Type C or Type F.

C. Aggregates:

1. Coarse Aggregates: ASTM C 33, coarse aggregates; washed and graded natural gravel or crushed stone graded from 3/8" to 3/4" with all particles clean, hard and durable while being free of dust, salt and other foreign matter.

a) For exterior exposed surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.

D. Water: Clean, drinkable.

2.4 Admixtures:

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water Reducing Admixture: ASTM C 494, Type A.

D. Water-Reducing, Non-Corrosive, Non-Chloride Accelerator: The admixture shall conform to ASTM C 494, Type C or E, and not contain more chloride ions than are present in municipal drinking water.
   1. Available Products: Subject to compliance with requirements, products may be incorporated in the work include, but are not limited to, the following:
      a) Accelguard 80; Euclid Chemical Co.

E. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and containing not more than 0.05 percent chloride ions.

F. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

2.5 Related Materials:

A. Expansion Joint Fillers: Premoulded asphalt ASTM D 994 for exterior work, asphalt impregnated fiberboard ASTM D 1751 for interior work. Depths and thicknesses as indicated on the Drawings.

B. Crushed Stone Fill Under Slabs on Grade: Crushed stone or gravel graded from 3/8" to 3/4" or 3/4" to 1".

C. Metal Screed Joints: Equal to Key-Loc Joint System as manufactured by Form-A-Key Products Division, 225 Eiler Ave., P.O. Box 14144, Louisville, KY 40214, Telephone (502)361-1396.
   1. Screed joint shall be constructed from 24 gauge galvanized steel with dowel knockouts on six inch centers and shaped to form a constant tongue and groove key between adjacent concrete floor slab sections.
   2. Joint forms shall be secured in place with 13 gauge HRPO steel stakes installed at 2 foot intervals.
   3. Provide "Snap-In" Joint Splice at joint butts.
   4. Provide stake clip when it is necessary to pour on the stake side first.
   5. Provide Key-Loc Joint manufactured in 10' lengths, for slab depths required. Joints are available for slab depths of 4", 5", 6", 8", 10" and 12". Stakes are pointed and have ratchet tops. Standard lengths are 12", 15", 18" 21" and 24". Provide 15" stakes for 4" slab depths and 18" stakes for 5" and 6" slab depths.

D. Non-Shrink Grout: CRD-C 621, factory pre-mixed non-metallic grout equal to "Five Star Grout" as manufactured by U.S. Grout Corp. or approved equal.

2.6 Curing Materials:

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

B. Moisture Retaining Cover: One of the following complying with ASTM C 171:
   1. Waterproof paper
   2. Polyethylene film
   3. Polyethylene coated burlap

C. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal. Subject to compliance with requirements, provide one of the following:
   1. "Masterseal", Mastic Builders
   2. "Clear Seal", A. C. Horn
   3. "Spartan-Cote", The Burke Co.
   4. "Kure-N-Seal", Sonneborn-Contech
   5. "L & M Cure", L & M Construction Chemicals

D. Use of liquid membrane-forming curing compound is strictly prohibited over concrete slabs scheduled to receive resilient flooring, ceramic or porcelain tile.

2.7 Vapor Retarders:

A. Manufacturers:
   1. Stego Wrap (15-mil) Vapor Barrier by Stego Industries LLC, San Juan Capistrano, CA, Tel.: (877) 464-7834, Website: www.stegoindustries.com.
   2. Raven Industries VaporBlock 15.
   3. W.R. Meadows Premoulded Membrane with Plasmatic Core.
   4. Zero-Perm by Alumiseal.

B. Vapor Barrier must meet or exceed the following properties:
   1. WVTR less than or equal to 0.006 gr/ft^2/hr as tested by ASTM E 96.
   2. ASTM E 1745 Class A (Plastics).

C. Accessories:
   1. Vapor Retarding Seam Tape:
      a) Tape must meet or exceed the following properties:
         (1) Water Vapor Transmission Rate: ASTM E 96, 0.3 perms or lower.
   2. Vapor Proofing Mastic:
      a) Mastic must meet or exceed the following properties:
         (1) Water Vapor Transmission Rate: ASTM E 96, 0.3 perms or lower.
   3. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

2.8 Proportioning and Design of Mixes:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed design mixes. The testing facility shall not be the same as used for quality control testing unless otherwise acceptable to Architect.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 3000 psi (20.7 Mpa).
   2. Slump: 4 inches (+/- 1").

D. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 3000 psi (20.7 Mpa).
   2. Minimum Cementitious Materials Content: 470 lb./cu. yd. (279 kg/cu. m.).
   3. Slump: 4 inches (+/- 1").

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash: 25 percent.

F. Maximum Water-Cementitious Materials Ratio: 0.50 for concrete required to have low water permeability. 0.45 for concrete exposed to deicers or subject to freezing and thawing while moist.

G. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
   1. 5.5 percent for 1-1/2-inch- (38-mm-) nominal maximum aggregate size.
   2. 6 percent for 1-inch- (25-mm-) nominal maximum aggregate size.
   3. 6 percent for 3/4-inch- (19-mm-) nominal maximum aggregate size.

H. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

2.9 Fabricating Reinforcement: 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 and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes: when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 — EXECUTION

3.1 Forms:
A. Construct so that concrete members and structures are of correct size, shape, alignment, elevation and position.
B. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required to eliminate mortar leaks.
C. Provide construction joint forms where concrete placement terminates at the end of a day or because of other reasons.
D. Provide bulkheads, with horizontal keyways and reinforcing steel penetrating bulkheads, where concrete placement stops at end of day or for other reasons.
E. Where soil conditions are such that concrete cannot be placed without forms, and where other conditions cause trenches to be opened wider than footing or slab widths, erect forms for footing or slab.
F. Install items furnished by others for installation in concrete. Use templates to locate anchor bolts and other critical items.
G. Prepare insides of forms so that concrete will have a smooth, uniform finish free of surface defects.
H. Coat forms before reinforcement steel is placed. Where mill-oiled forming material is used, follow manufacturer's instructions for recoating. Where forming material is not mill-oiled, coat forms before each use.
I. Before reusing forms, thoroughly clean them and remove projecting nails or similar devices.

3.2 Building Slab Drainage Course:
A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, conforming to indicated cross section and thickness. Maintain optimum moisture content for compacting material during placement operations.
B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and during placement operations.
C. When a compacted drainage course is shown to be 6" thick or less, place material in a single layer.

3.3 Vapor Barrier Installation:
A. Preparation: Ensure that subsoil is approved by Architect.
1. Level and tamp or roll aggregate, sand or tamped earth base.

B. Installation: Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98.
   1. Unroll vapor barrier with the longest dimension parallel with the direction of the pour.
   2. Lap vapor barrier over footings and seal to foundation walls.
   3. Overlap joints 6 inches and seal with manufacturer's tape.
   4. Seal all penetrations (including pipes) per manufacturer's instructions.
   5. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.
   6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

3.4 Placing 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.
B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as required.
D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set tie wires so ends are directed into concrete, not toward exposed concrete surfaces.
E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
F. Protect reinforcing by thickness of concrete indicated. Where not indicated, thickness of concrete over reinforcing shall be as follows:
   1. Where concrete is deposited against the ground without use of forms - 3 inches.
   2. Where concrete is exposed to weather or to ground, but placed in forms - 2 inches for bars larger than No. 5 and 1-1/2 inches for No. 5 bars or smaller.
   3. In beams, girders, and columns not exposed to the ground or to the weather - 1-1/2 inches.
   4. Variation from clear cover and depth of members shall conform to Section 7.5 of ACI-83.

3.5 Joints:
A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

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. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) 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, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 Concrete Placement:

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. Comply with ACI, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is complete.

D. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into forms.
E. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement and curing.
   1. In cold weather comply with ACI 306.
   2. In hot weather comply with ACI 305.
F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
   1. When air temperature has fallen to or is expected to fall below 40 deg. F., uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F., and not more than 80 deg. F. at point of placement.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Only the specified non-corrosive, non-chloride accelerator shall be used. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.
G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
   1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg. F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
   2. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.7 Monolithic Slab Finishes:
A. Float Finish:
   1. Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.
   2. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
B. Trowel Finish:
   1. Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thin film finish coating system.
   2. After floating, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation,

free of trowel marks, uniform in texture and appearance. Grind smooth surface defects that would telegraph through applied floor covering system.

C. Trowel and Fine Broom Finish: Where ceramic or porcelain is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

D. Non-Slip Broom Finish:
   1. Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
   2. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

E. Finish surfaces to the following tolerances according to ASTM E 1155/E for randomly trafficked floor surface: specified overall values for flatness, F(F) 25; and levelness, (F)L 20; with minimum local values of flatness, F(F) 17; and levelness F(L) 15.

3.8 Grouting: All column base plates and other locations noted on the structural drawings shall be grouted with specified non-shrink grout. All exposed grout shall be the specified non-metallic type.

3.9 Concrete Curing and Protection:

A. General:
   1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   2. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
   3. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture retaining cover curing, and by combinations thereof, as herein specified.
   1. Provide moisture curing by following methods:
      a) Keep concrete surface continuously wet by covering with water.
      b) Continuous water-fog spray.
      c) Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
   2. Provide moisture-cover curing as follows:
      a) Cover concrete surface with moisture retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by water proof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   3. Provide curing and sealing compound to interior slabs left exposed; and to exterior slabs, walks, and curbs, as follows:
      a) Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3

hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, flooring (such as resilient flooring, ceramic or porcelain tile) and other coatings and finish materials, unless otherwise acceptable to Architect.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

E. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture retaining cover, unless otherwise directed.

F. Sealer and Dustproofer: Apply a second coat of specified curing and sealing compound only to surfaces given a first coat.

3.10 Removal of Forms:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F. (10 C.) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

3.11 Re-Use of Forms:

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.12 Miscellaneous Concrete Items:

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at

correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.13 Concrete Surface Repairs:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

B. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete, but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

C. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

D. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

E. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.

G. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop outs, honeycombs, rock pockets and other objectionable conditions.

H. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

I. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.

J. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

K. Repair isolated random cracks and single holes not over 1" in diameter by dry pack method. Groove top clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
L. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.
M. Repair methods not specified above may be used, subject to acceptance of Architect.

END OF SECTION 03 30 00

SECTION 04 20 00 — UNIT MASONRY

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all unit masonry indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Section 04 43 13 – Fieldstone Masonry Veneer, Section 04 72 00 – Cast Stone Masonry, and Section 07 92 00 – Joint Sealants.

1.3 Quality Assurance:
- A. Owner will engage a testing and inspection agency to perform testing and special inspections. Verify if special inspections are required by the local building official in accordance with IBC Chapter 17.
- B. Provide prism test in accordance with ASTM C 1314 at beginning of masonry construction and every 5,000 square feet thereafter.
- C. Test each day's placement of grout in accordance with ASTM C 39. Provide results to Contractor and Architect.
- D. Testing and inspecting agency shall periodically monitor mortar batch proportions and mixing times for conformance with ACI 530.1 "Specification for Masonry Structures".
- E. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- F. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- G. Field Constructed Mock-Ups: Prior to installation of masonry work, erect sample wall panels to further verify selections made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction; build mock-ups to comply with the following requirements:
  1. Build 2'-8" long by 2'-0" high mock-up for typical exterior face brick wall.
  2. Where masonry is to match existing, erect panels parallel to existing surface.
  3. Retain mock-ups during construction as standard for judging completed masonry work. When directed, demolish mock-ups and remove from site.
- H. Fire Performance Characteristics: Where indicated, provide materials and construction that are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E 119 by a recognized testing and inspecting organization or by another means as acceptable to authority having jurisdiction.
- I. Masonry Contractor's Qualifications: The qualifications of the Masonry Contractor for this project shall be as follows:

1. The Masonry Contractor shall have been in the masonry contracting business for the last three (3) consecutive years and under their current corporation name with essentially the same corporate officers.
2. The Masonry Contractor shall have successfully completed at least three (3) projects of comparable size and scope.
3. The Masonry Contractor's main office shall be located within 120 miles driving distance of the project unless pre-approval has been issued in writing by the Owner and Architect.
4. The Masonry Contractor shall have an active license by the State of Alabama as a Subcontractor with a specialty in BC-S: Masonry or the General Contractor shall have a BC-S Specialty Construction for Masonry license with the State of Alabama.
5. The Masonry Contractor shall provide substantiating proof of these requirements to General Contractor prior to the Bid.

1.4 Submittals:

A. Submit samples of face brick to Architect for approval. Do not order face brick without written approval from Architect.
B. Stone trim samples not less than 12" in length showing full range of exposed color and texture to be expected in finish work.
C. Shop Drawings: Submit cutting and setting drawings for stone trim showing sizes, profiles and locations of each unit required.
D. Submit product data for concrete masonry construction.
E. Submit plan layout and plan details of masonry reinforcing. Detail in accordance with ACI SP-66 (includes ACI 315 "Details and Detailing of Concrete Reinforcement"). Provide elevations of reinforced walls. Indicate locations of reinforced and unreinforced cells.
F. Submit mix design and strength data for grout. Grout shall be in accordance with ASTM C 476 and ACI 530.1.

1.5 Delivery, Storage, and Handling:

A. Deliver masonry materials to project in undamaged condition.
B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.
C. Store cementitious materials off the ground, under cover and in dry location.
D. Store aggregates where grading and other required characteristics can be maintained.
E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.6 Project Conditions:

A. Protection of Work: During erection, cover top of walls with heavy waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.
B. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
C. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.
D. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

E. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.
F. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
G. Protect sills, ledges and projections from droppings of mortar.

1.7 Cold Weather Protection:
A. Construct masonry in accordance with "Specification for Masonry Structures", ACI 530.1 concerning cold weather.
B. Do not lay masonry units that are wet or frozen.
C. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
D. Remove all masonry determined to be frozen or damaged by freezing conditions.
E. Do not lay masonry when the temperature of the outside air is below 40 degrees unless suitable means as approved by the Architect are provided to heat materials, protect work from cold and frost and ensure that mortar will harden without freezing. No antifreeze ingredient shall be used in the mortar.
F. Protect completed masonry work at end of each day's work by covering with a weather-resistive membrane.

1.8 Hot Weather Protection:
A. Construct masonry in accordance with "Specification for Masonry Structures", ACI 530.1 concerning hot weather.
B. Reduce time of use after mixing for mortar and grout as required during hot weather.
C. See 03 30 00 for hot weather concrete requirements for use with ready mix grout.

PART 2 — PRODUCTS

2.1 Face Brick:
A. Quality Standard: ASTM C 216, Grade SW, Type FBS.
B. Size: Modular, 2-1/4" x 3-3/4" x 7-5/8".
C. Allowance: Include in the Bid an allowance of $350.00/M plus sales tax for the purchase of face brick as selected by the Architect.

2.2 Concrete Blocks:
A. Quality Standard: ASTM C 90. Minimum net area compressive strength of 1900 psi.
B. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" (15-5/8" x 7-5/8" actual), unless otherwise indicated.
C. Shall be Grade "N" constructed from Portland cement and aggregates of gravel, crushed stone, shale or blast furnace slag.

2.3 Grout:
A. Grout shall meet the compressive strength requirements indicated and shall be in accordance with ASTM C 476. Grout shall be provided by a ready-mix concrete supplier.

2.4 Mortar Materials:

A. Portland Cement: Shall be an approved masonry cement conforming to ASTM C 91, Type "S" for below grade applications and above grade load bearing masonry walls; Type "N" for above grade non-load bearing masonry walls.

B. Sand: ASTM C 144, clear, well graded and free of organic and other deleterious substances.

C. Water: Clean, free of deleterious materials which would impair strength or bond.

2.5 Masonry Reinforcing:

A. Masonry Reinforcing: Deformed, steel Grade 60 reinforcing bars and accessories in accordance with ASTM A 615 and ACI 530.1.

2.6 Masonry Accessories:

A. Continuous Wire Reinforcing: Provide welded wire units prefabricated in straight lengths of not less than 10', with matching corner and tee units equal to Series 300, 2-Wire System as manufactured by Wire-Bond or approved equal. Fabricate from cold-drawn steel wire complying ASTM A 82, with deformed continuous side rods and plain cross-rods, and a unit width approximately 2" less than thickness of wall or partition. Units shall be truss type fabricated with single pair of 9 gauge side rods and 9 gauge continuous diagonal cross-rods spaced not more than 16" o.c.

B. Masonry Anchors (Brick to Metal Stud Backup Through Sheathing): Galvanized 12 gauge anchor plate and 3/16" diameter wire equal to RJ-711 adjustable veneer anchor as manufactured by Wire-Bond or approved equal.

C. Vinyl Sheet Masonry Flashing: Flexible sheet flashing especially formulated from virgin polyvinyl chloride with plasticizers and other modifiers to remain flexible and waterproof in concealed masonry applications, black in color and 56 mils in thickness.

D. Mortar Netting: Provide trapezoidal-shaped recycled polyester/polyethylene mesh as manufactured by Mortar Net, 541 South Lake St., Gary, IN 46403, Tel. (800) 664-6638, Fax. (219) 939-3877. The mortar netting shall be designed to maintain airflow and drainage while suspending mortar droppings at unequal heights. Provide one or more thickness as required to fill cavity width.

E. Weep Cell Vents: Provide 3/8" w. x 2-1/2" h. x 3-3/8" d. cell vents for weep holes as manufactured from flexible ultra violet resistant polypropylene co-polymer equal to Dur-O-Wal D/A 1006. Furnish in transparent, grey, almond, brown or cocoa color as selected by Architect. Set in the head (vertical) joint on top of the thru-wall flashing at weep joint spacing required.

2.7 Dampproofing: "Hydrocide 700B Semi-Mastic" fibrated asphalt emulsion as manufactured by Sonneborn Building Products or approved equal for dampproofing concrete block backup walls.

2.8 Masonry Cavity Wall Insulation: 1" thick x 16" wide "Foamular 250" extruded polystyrene closed-cell foam panel with continuous skins on face and back surfaces as manufactured by Owens Corning or prior approved equal in brick cavities as indicated on the Drawings.

2.9 PVC Control Joints: 6-7/8" wide, high grade poly-vinyl chloride compound conforming to ASTM D 2287 type PVC 654-4 with a durometer hardness of 90 when tested in conformance with ASTM D-2240 and equal to No. AA2003 as manufactured by AA Wire Products Co.

2.10 Masonry Cleaner: Job-mixed detergent solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.

PART 3 — EXECUTION

3.1 Installation, General:

A. Thickness: Build masonry construction to the full thickness shown, except, build single-wythe walls (if any) to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

B. Cut masonry units with motor-driven saw designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.

C. Pattern Bond: Lay concrete block in running bond. Lay concealed masonry with all units in a wythe bonded by lapping not less than 2".

D. Lay-up walls plumb and true and with courses level, accurately spaced and coordinated with other work.

E. Fill space between hollow metal frames and masonry solidly with mortar.

3.2 Mortar Bedding and Jointing:

A. Use Type S mortar for below grade applications and above grade loadbearing masonry walls and Type N for above grade non-load bearing masonry walls.

B. Measure and batch materials either by volume or weight, such that the required proportions for mortar can be accurately controlled and maintained. Measurement of sand exclusively by shovel will not be permitted.

C. Mix mortars with the maximum amount of water consistent with workability to provide maximum tensile bond strength within the capacity of the mortar.

D. Mix mortar ingredients for a minimum of 5 minutes in a mechanical batch mixer. Use water clean and free of deleterious materials that would impair the work. Do not use mortar that has begun to set, or if more than 2-1/2 hours has elapsed since initial mixing. Retemper mortar during 2-1/2 hour period as required to restore workability.

E. Lay brick and other solid masonry units with completely filled bed, head and collar joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

F. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells; also bed webs in mortar in starting course on footings and foundation wall and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.

G. Joints: Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not otherwise indicated, lay walls with 3/8" joints. Cut joints flush for masonry walls that are to be concealed or to be covered by other material. Tool exposed joints to slightly concave. Rake out mortar in preparation for application of caulking or sealants where shown.

H. Remove masonry units disturbed after laying, clean and relay in fresh mortar.

3.3 Horizontal Joint Reinforcement:

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6".

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.
D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
E. Space horizontal joint reinforcement at 16" o.c. vertically, unless other indicated. For parapets, space reinforcement 8" o.c. vertically, unless otherwise indicated.
F. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints. In addition to wall reinforcement, provide additional reinforcement at openings as indicated on the Drawings.

3.4 Cavity Walls:
A. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity, flush.
B. Provide weep holes in exterior wythe of cavity, composite and veneer walls located immediately above ledges and flashing, spaced 2'-8" o.c., unless otherwise indicated.
C. Install masonry cavity wall insulation by cutting board accurately to fit between ties where necessary. Do not push masonry ties through insulation. Butt edges tightly together. Install insulation board as brickwork progresses, installing masonry ties so that legs hold the insulation firmly against the backup wall; the air space must be maintained between the brick and insulation.
D. Anchor masonry veneer to metal studs with metal ties embedded in masonry joints and screw fastened to metal studs through sheathing. Provide not less than 1" air space between masonry veneer. Screw anchors through to studs. Space veneer anchors as shown, or if not shown, space not more than 24" o.c. vertically and horizontally. Provide additional anchors within 1'-0" of openings and space not more than 3'-0" around perimeter.
E. Mortar Netting: Install mortar netting in cavity walls in accordance with manufacturer's instructions immediately above flashing where weep holes are indicated on the Drawings.
F. Reinforced Walls: Install reinforcing in accordance with drawings positioned securely at proper location prior to and during grouting. Provide lap splices as indicated. Provide lap splices for all continuous reinforcing. Do not place through-wall flashing in reinforced walls.

3.5 Lintels:
A. Install loose lintels of steel and other materials where shown.
B. Provide masonry lintels where shown and wherever openings of more than 1'-0" are shown without structural steel or other supporting lintels. For hollow concrete masonry unit walls, use specially formed "U" -shaped lintel units with reinforcing bars placed as shown and filled with concrete grout. Provide minimum bearing at each jamb, of 4" for openings less than 6'-0" wide, and 8" for wider openings.

3.6 Control Joints:

A. General: Provide vertical expansion, control and isolation joints in masonry where shown. Build-in related items as the masonry work progresses.
B. Build-in non-metallic joint fillers where indicated.

3.7 Flashing of Masonry Work:

A. Provide concealed flashings in masonry work at, or above, all shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections that could puncture flashing. Place through-wall flashing on bed of mortar. Seal penetrations in flashing with mastic before covering with mortar. Do not place through-wall flashing in reinforced walls.
B. Extend flashings the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from a line 1/2" in from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing complete through the inner wythe and turn up approximately 2".
C. Provide weepholes in the head joints of the same course of masonry bedded in the flashing mortar.
D. Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

3.8 Repair, Pointing and Cleaning:

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
B. Masonry with low-strength grout or improper placement may be determined as unacceptable and require replacement. Contractor is responsible for all costs associated with replacement due to unacceptable construction.
C. Pointing: During the tooling of joints, enlarge any voids or holes, except weepholes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.
D. Clean exposed brick masonry surfaces by the bucket and brush hand cleaning method or by high pressure water method.
E. Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.

END OF SECTION 04 20 00

SECTION 04 43 13 — FIELDSTONE MASONRY VENEER

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all fieldstone masonry veneer indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere:
  1. Section 04 20 00 – Unit Masonry.
  2. Section 04 72 00 – Cast Stone Masonry.
  3. Section 07 92 00 – Joint Sealants.

1.3 Submittals:
- A. Submit samples of fieldstone to Architect for approval.

1.4 Standards:
- A. ANSI "American Standard Building Code Requirements for Masonry" and "Building Code Requirements for Reinforced Masonry."

PART 2 — PRODUCTS

2.1 Fieldstone Allowance: Include in the Bid a lump sum allowance of $8,000.00 plus sales tax for the purchase of Fieldstone as selected by the Architect. The Fieldstone shall be as selected by Architect and approved by the Owner. Fieldstone shall be of random face sizes and random thicknesses. Face sizes up to 26" and thicknesses from 4" to 6".

2.2 Masonry Materials:
- A. Masonry Cement: An approved masonry cement conforming to ASTM C91, gray. Architect to select specific gray to be used.
- B. Sand: Clean, well screened, natural, ASTM C144.
- C. Water: Potable.

2.3 Mortar Mixing:
- A. Proportion and mix according to ASTM C270, to a flow of 100 to 115, Type N Mortar.
- B. Maintain accurate control, mix in mechanically operated drum type batch mixer; mix materials two minutes, add water and continue three minutes.
- C. Evidence of improper mixing or changing of proportion that could result in lower strength mortar will be cause for rejection of the work.
- D. Use maximum mixing water that can be used and still maintain workable mix, to increase bond.

PART 3 — EXECUTION

3.1 General:

A. No stone work when ambient temperature is below 35 degrees F. Do not build on frozen work or surface with water or frost film. Protect masonry from freezing for 48 hours after being laid.

B. Unless otherwise required, completely fill spaces around built-in items with mortar. Install anchors, flashing, etc., as the wall is laid.

C. Step back unfinished work for joining with new; do not "tooth" unless specifically approved. Protect tops or openings in exposed stone walls from rain or snow with a strong waterproof membrane, adequately secured in place.

D. Do not use mortar that has begun to set; do not use mortar more than 2-1/2 hours after mixing when air temperature is 80 degrees F or higher more than 3-1/2 hours after mixing when air temperature is less than 80 degrees F.

3.2 Laying Fieldstone:

A. General: Shape stone with standard stone masonry tools. Lay stone in accordance with common "random size" methods. Shape random sizes. Coordinate general sizes and arrangements of stone with the Architect. Appearance of walls to match existing wall that this project abuts.

B. Masonry Ties (Specified in Section 04 20 00 - Unit Masonry): Space 16" o.c. horizontally and vertically into stone mortar joints.

C. Thru-Wall Flashing: See Section 04 20 00 - Unit Masonry.

3.3 Cleaning:

A. Clean off loose mortar without damage to stone. Cut out defective joints, repoint and tool to match adjacent work.

B. Insure adequate water supply for presoaking and rinsing. Delay cleaning of any section at least 28 days after topping out.

C. Use "Sure Klean" or approved equal in strict accordance with manufacturer's instructions. Specific product shall be as recommended by the manufacturer for the type masonry involved.

D. Protect non-masonry surfaces. Masonry below the working area shall be kept wet by flushing with water.

E. High pressure water cleaning methods are not permitted.

END OF SECTION 04 43 13

SECTION 04 72 00 — CAST STONE MASONRY

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all cast stone masonry indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Section 03 30 00 – Cast-In-Place Concrete, Section 04 20 00 – Unit Masonry, Section 04 43 13 – Fieldstone Masonry Veneer, and Section 07 92 00 – Joint Sealants.

1.3 References:
- A. ACI 318 – Building Code Requirements for Reinforced Concrete.
- B. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet- Steel Bars for Reinforced Concrete.
- D. ASTM C 33 - Standard Specification for Concrete Aggregates.
- E. ASTM C 150 - Standard Specification for Portland Cement.
- F. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method.
- G. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- H. ASTM C 260 - Standard Specification for Air-Entrained Admixtures for Concrete.
- I. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- J. ASTM C 426 - Standard Test Method for Linear Shrinkage of Concrete Masonry Units.
- K. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.
- L. ASTM C 618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- M. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- N. ASTM C 979 - Standard Specification for Coloring Pigments for Integrally Pigmented Concrete.
- O. ASTM C 989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete.
- P. ASTM C 1116 - Standard Specification for Fiber Reinforced Concrete and Shotcrete.
- Q. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
- R. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone.
- S. ASTM C 1364 - Standard Specification for Architectural Cast Stone.
- T. ASTM D 2244 - Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

U. Cast Stone Institute® Technical Manual (Current Edition).

1.4 Definitions:

A. Cast Stone: A refined architectural concrete building unit manufactured to simulate natural cut stone, used in Division 4 masonry applications.
   1. Dry Cast: Manufactured from zero slump concrete.
      a) Vibrant Dry Tamp (VDT) Casting Method: Vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.
      b) Machine Casting Method: Manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.
   2. Wet Cast: Manufactured from measurable slump concrete.
      a) Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.5 Submittals:

A. Comply with Section 01 33 00 – Submittal Procedures.
B. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.
C. Test results: Submit manufacturers test results of Cast Stone previously made by the manufacturer.
D. Shop Drawings: Submit manufacturers shop drawings including profiles, cross-sections, reinforcement, exposed faces, arrangement of joints (optional for standard or semi-custom installations), anchoring methods, anchors (if required), annotation of stone types and their location.
E. Warranty: Submit Cast Stone Institute® Member Limited Warranty.
F. Certification: Submit valid Cast Stone Institute® Plant Certification.

1.6 Quality Assurance:

A. Manufacturer Qualifications:
   1. Cast Stone shall be produced in a plant certified by the Cast Stone Institute®.
   2. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
   3. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with owner, architect and contractor references.
B. Standards: Comply with the requirements of the Cast Stone Institute® Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.
C. Mock-up: Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.
D. Warranty Period: 10 years.

1.7 Delivery, Storage and Handling:

A. Pack, handle, and ship cast stone units in suitable packs or pallets.
   1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.

2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

B. Store installation materials on elevated platforms, under cover, and in a dry location.

C. Store mortar aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.8 Coordination:

A. Coordinate production and delivery of cast stone with unit masonry work to minimize the need for on-site storage and to avoid delaying the Work.

PART 2 — PRODUCTS

2.1 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. Bassco Caststone

2.2 Architectural Cast Stone:

A. Comply with ASTM C 1364.

B. Provide the following physical properties:

1. Compressive Strength: ASTM C 1194: 6,500 psi minimum for products at 28 days.
2. Absorption: ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.
3. Air Content: ASTM C 173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.
4. Freeze-Thaw: ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
5. Linear Shrinkage: ASTM C 426: Shrinkage shall not exceed 0.065%.

C. Job Site Testing: One sample from production units may be selected at random from the field for each 500 cubic feet delivered to the job site.

1. Three field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
2. Three field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

2.3 Raw Materials:

A. Portland Cement: Type I or Type III, white and/or grey, ASTM C 150.

B. Coarse Aggregates: Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the VDT casting method.

C. Fine Aggregates: Manufactured or natural sands, ASTM C 33, except for gradation.

D. Colors: Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.

E. Admixtures: Comply with the following:

1. ASTM C 260 for air-entraining admixtures.

2. ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.
3. Other admixtures: Integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.

F. Water: Potable.

G. Reinforcing Bars:
1. ASTM A 615/A 615M: Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in.
2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.4 Color and Finish:

A. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. and the density of such voids shall be less than 3 occurrences per any 1 in.² and not obvious under direct daylight illumination at a 5 ft. distance.

B. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft. distance.
1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
a) Total Color Difference: Not greater than 6 units.
b) Total Hue Difference: Not greater than 2 units.

C. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft. distance.

D. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.

E. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.5 Reinforcing:

A. Reinforce the units as required by the drawings and for safe handling and structural stress.

B. Minimum reinforcing shall be 0.25 percent of the cross section area.

C. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

D. Panels, soffits and similar stones greater than 24 in. in one direction shall be reinforced in that direction. Units less than 24 in. in both their length and width dimension shall be non-reinforced unless otherwise specified.

E. Welded wire fabric reinforcing shall not be used in dry cast products.

2.6 Curing:

A. Cure units in a warm curing chamber approximately 100ºF (37.8ºC) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70ºF (21.1ºC) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F (10°C) or 5 days @ 70°F (21°C)) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.7 Manufacturing Tolerances:
- A. Cross section dimensions shall not deviate by more than ±1/8 in. from approved dimensions.
- B. Length of units shall not deviate by more than length/ 360 or ±1/8 in., whichever is greater, not to exceed ±1/4 in.
  1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- C. Warp, bow or twist of units shall not exceed length/ 360 or ±1/8 in., whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features. On formed sides of unit, 1/8 in., on unformed sides of unit, 3/8 in. maximum deviation.

2.8 Production Quality Control:
- A. Testing:
  1. Test compressive strength and absorption from specimens taken from every 500 cubic feet of product produced.
  2. Perform tests in accordance ASTM C 1194 and C 1195.
  3. Have tests performed by an independent testing laboratory every six months.
  4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.
  5. Retain copies of all test reports for a minimum of two years.

2.9 Delivery, Storage and Handling:
- A. Mark production units with the identification marks as shown on the shop drawings.
- B. Package units and protect them from staining or damage during shipping and storage.
- C. Provide an itemized list of product to support the bill of lading.

PART 3 — EXECUTION

3.1 Examination:
- A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Unacceptable units shall not be set.

3.2 Setting Tolerances:
- A. Comply with Cast Stone Institute® Technical Manual.
- B. Set stones 1/8 in. or less, within the plane of adjacent units.
- C. Joints, plus - 1/16 in., minus - 1/8 in.

3.3 Jointing:

A. Joint Size:
   1. At stone/brick joints 3/8 in.
   2. At stone/stone joints in vertical position 1/4 in. (3/8 in. optional).
   3. Stone/stone joints exposed on top 3/8 in.
B. Joint Materials:
   1. Mortar, Type N, ASTM C 270.
   2. Use a full bed of mortar at all bed joints.
   3. Flush vertical joints full with mortar.
   4. Leave all joints with exposed tops or under relieving angles open for sealant.
   5. Leave head joints in copings and projecting components open for sealant.
C. Location of Joints:
   1. As shown on shop drawings.
   2. At control and expansion joints unless otherwise shown.

3.4 Setting:
A. Drench units with clean water prior to setting.
B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
C. Set units in full bed of mortar, unless otherwise detailed.
D. Rake mortar joints 3/4 in. in for pointing.
E. Remove excess mortar from unit faces immediately after setting.
F. Tuck point unit joints to a slight concave profile.

3.5 Joint Protection:
A. Comply with requirements of Section 07 92 00.
B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6 Repair and Cleaning:
A. Repair chips with touchup materials furnished by manufacturer.
B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
C. Consult with manufacturer for appropriate cleaners.

3.7 Inspection and Acceptance:
A. Inspect finished installation according to Cast Stone Institute® Technical Bulletin #36.
B. Do not field apply water repellent until repair, cleaning, inspection and acceptance is completed.

3.8 Water Repellent:
A. Apply water repellent in accordance with Cast Stone Institute® Technical Bulletin #35 or water repellent manufacturer's directions.

END OF SECTION 04 72 00

SECTION 05 12 10 — STRUCTURAL AND MISCELLANEOUS STEEL

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all structural and miscellaneous steel indicated on Drawings and specified herein.

B. Related Work Specified Elsewhere: Section 03 30 00 – Cast-In-Place Concrete, Section 04 20 00 – Unit Masonry, Section 05 50 00 – Metal Fabrications and Section 06 61 00 – Rough Carpentry.

1.3 Quality Assurance:

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
2. AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", including the "Commentary" and Supplements thereto as issued.
3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
4. AWS D1.1 "Structural Welding Code".
5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

1.4 Submittals:

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
2. High-strength bolts (each type), including nuts and washers.
3. Structural steel primer paint.
4. Shrinkage-resistant grout.

B. Shop Drawings:

1. Submit shop drawings including complete details and schedules for fabrication and assembly of structural steel member's procedures and diagrams.
2. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length and type of each weld.
3. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.

1.5 Delivery, Storage and Handling:

A. Deliver materials to site at such intervals to insure uninterrupted programs of work.
B. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
C. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 — PRODUCTS

2.1 Metal Surfaces, General: For fabrication of 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. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

2.2 Materials:
A. Structural Steel Shapes, Plates and Bars: ASTM A 36, except ASTM A992 Grade 50 for W-shapes.
B. Cold-Formed Steel Tubing: ASTM A 500, Grade B.
C. Anchor Bolts: ASTM F1554 Grade 36 headed type unless otherwise indicated.
D. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
   1. Quenched and tempered with medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.
E. Electrodes for Welding: Comply with AWS Code.
F. Structural Steel Primer Paint: Fabricator's standard rust-inhibiting primer.
G. Non-Shrink Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sand, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

2.3 Fabrication:
A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
C. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
D. Connections: Weld or bolt shop connections, as indicated.
E. Bolt field connections, except where welded connections or other connections are indicated.
   1. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
F. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

G. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
H. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.4 Shop Painting:
A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete mortar. Paint embedded steel that is partially exposed on exposed portions and initial 2" of embedded areas only.
1. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
1. SP-1 "Solvent Cleaning."
2. SP-2 "Hand Tool Cleaning."
3. SP-3 "Power Tool Cleaning."
C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide a uniform dry film thickness of 1.5 mils. Use painting methods that result in full coverage of joints, corners, edges and exposed surfaces.

PART 3 — EXECUTION

3.1 Inspection: Erector must examine areas and conditions under which structural steel work is to be installed, and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.

3.2 Erection:
A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
B. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.
C. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
D. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
1. Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.
E. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surfaces of base and bearing plates.
F. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

G. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
H. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
   1. For proprietary grout materials, comply with manufacturer's instructions.
I. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
J. Level and plumb individual members of structure within specified AISC tolerances.
K. Splice members only where indicated and accepted on shop drawings.
L. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.
M. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
N. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
O. Gas Cutting: Do not use gas-cutting torches in field for correcting fabrication errors in structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
P. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas with same material as used for shop painting.
Q. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

3.3 Field Quality Control:
A. The Owner may engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
B. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Perform visual inspection of all welds.
C. Field Bolted Connections: Inspect in accordance with AISC specifications.
D. Field Welding: Inspect and test during erection of structural steel as follows:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Perform visual inspection of all welds.

END OF SECTION 05 12 10

SECTION 05 40 00 — COLD-FORMED METAL FRAMING

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all cold-formed metal framing indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Section 06 61 00 – Rough Carpentry, Section 09 21 16 – Gypsum Board Assemblies, and Section 09 22 16 – Non-Structural Metal Framing.

1.3 Submittals:
- A. Product Data: Submit manufacturer's product information and installation instructions for each time of cold-formed metal framing and accessories.
- B. Shop Drawings: Show layout, spacings, sizes, thickness, and types of cold-formed metal framing; fabrications; fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, blocking, splices, accessories, connection details, and attachment to adjoining work.

1.4 Delivery, Storage and Handling: Protect metal framing units from rusting and damage. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off ground in a dry ventilated space or protect with breathable waterproof tarpaulins.

PART 2 — PRODUCTS

2.1 Manufacturers: Subject to compliance with requirements, provide products of one of the following:
- A. Alabama Metal Industries Co.
- B. Bostwick Steel Framing Co.
- C. Dale Industries, Inc.
- D. Milcor Division, Inryco, Inc.
- E. Marino Industries Corp.
- F. U.S. Gypsum Co.

2.2 Metal Framing:
- A. System Components: With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturers for applications indicated, as needed to provide a complete metal framing system.
- B. Materials and Finishes:

1. For 18 gauge and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 653, A 1011, or A 1008. For 16 gauge and heavier units, fabricate metal framing components of commercial quality steel sheets with a minimum yield point of 50,000 psi.
2. Provide galvanized finish to metal framing components complying with ASTM A 653 for minimum G 60 coating.
3. Fasteners: 1/2" Type S-12 pan head screws, unless noted otherwise in Drawings.

PART 3 — EXECUTION

3.1 Installation:

A. Manufacturer's Instructions: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations, unless otherwise indicated.

B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved and as indicated on Drawings, except do not exceed 16" o.c. spacing for all types of fasteners. Provide fasteners at corners and ends of tracks.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.

E. Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case considering weight or loading resulting from item supported.

F. Installation of Wall Stud System: Secure studs to top and bottom runner tracks by screw fastening at both inside and outside flanges.

G. Frame interior wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

H. Frame exterior wall openings as indicated in Drawings.

I. Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 4'-6" o.c.

END OF SECTION 05 40 00

SECTION 05 50 00 — METAL FABRICATIONS

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all metal fabrications indicated on Drawings and specified herein. Types of work in this section include fabrications for:
  1. Loose bearing and leveling plates
  2. Loose steel lintels
  3. Miscellaneous framing and supports
  4. Miscellaneous steel trim
- B. Related Work Specified Elsewhere: Section 05 12 10 – Structural and Miscellaneous Steel.

1.3 Quality Assurance:
- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for adjustments and fitting where taking of field measurements before fabrication might delay the work.
- B. Shop Assembly: Preassemble items in shop in 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.

1.4 Submittals:
- A. Product Data: Submit manufacturer's, fabricator's and finisher's specifications and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop Drawings: Submit shop drawings for fabrication and installation of miscellaneous metal fabrications. Include plans, elevations and detail sections. Indicate materials, methods, finishes and types of joinery, fasteners, anchorages and accessory items; specify finishes. Provide setting diagrams and templates for anchorages, sleeves and bolts installed by others.

PART 2 — PRODUCTS

2.1 Materials:
- A. 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 Tubing: Cold formed, ASTM A 500; or hot-rolled, ASTM A 501.
4. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.
5. 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.
6. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

B. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C588. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

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. Metal Primer Paint: Red lead mixed pigment, alkyd varnish, linseed oil paint, FS TT-P-86, Type II; or red lead iron oxide, raw linseed oil, alkyd paint, Steel Structures Painting Council (SSPC) Paint 2-64; or basic lead silico chromate base iron oxide, linseed oil, alkyd paint, FS TT-P-615, Type II.
2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9.

2.2 Fabrication, General:

A. Workmanship:
1. Use 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 shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
3. 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.
4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown or, if not shown, Phillips flat head (countersunk) screws or bolts.

5. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
6. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

B. Shop Painting:
1. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.
2. Remove scale, rust and other deleterious materials before applying shop coat. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning", or SSPC SP-3 "Power Tool Cleaning", or SSPC SP-7 "Brush-Off Blast Cleaning". Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning".
3. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat. Use painting methods that will result in full coverage of joints, corners, edges and exposed surfaces.
4. Apply one shop coat to fabricated metal items, except apply two coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.3 Miscellaneous Metal Fabrications:

A. Rough Hardware:
1. 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.
2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections, elsewhere, furnish steel washers.

B. Loose Steel Lintels:
1. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 8" bearing at each side of openings, unless otherwise indicated.

C. Miscellaneous Framing and Supports:
1. Provide miscellaneous steel framing and supports that are not a part of structural steel framework, as required to complete work.
2. Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
3. 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.

D. Miscellaneous Steel Trim:
1. Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with

continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

PART 3 — EXECUTION

3.1 Preparation: 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. General:

1. 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, lag bolts, wood screws and other connectors as required.
2. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.
3. Fit exposed connections accurately together to form tight hairline 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.
4. 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.

B. Setting Loose Plates:

1. Clean concrete and masonry bearing surfaces of any bond-reduction materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
2. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.
3. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 Adjust and Clean:

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as

used for shop painting. Apply brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION 05 50 00

SECTION 06 10 00 — ROUGH CARPENTRY

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of all rough carpentry work indicated on Drawings and specified herein.

1.3 References:
- A. Lumber Standards: Comply with PS 20 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: 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: 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.

PART 2 — PRODUCTS

2.1 Lumber, General:
- A. Factory-mark each piece of lumber with type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.
- B. 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.
- C. Provide dressed lumber, S4S, unless otherwise indicated.
- D. Provide seasoned lumber with 19% maximum moisture content at time of dressing.

2.2 Studs (2"-4" Thick, 2"-6" Wide, 10' and Shorter): Stud grade Western Spruce or Spruce-Pine-Fir.

2.3 Structural Light Framing (2"-4" Thick, 2"-6" Wide): No. 2 Common Southern Yellow Pine.

2.4 Structural Joists and Planks (2"-4" Thick, 5" and Wider): No. 2 Common Southern Yellow Pine or other approved species.

2.5 Treated Lumber:

A. 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 AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.
B. 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: Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.6 Plywood Roof Sheathing: Exposure 1 sheathing.
A. Span Rating: Not less than 48/24.
B. Nominal Thickness: Not less than 3/4 inch.

2.7 Plywood Wall Sheathing: Exposure 1 sheathing.
A. Span Rating: Not less than 32/16.
B. Nominal Thickness: Not less than 1/2 inch.

2.8 Miscellaneous Materials:
A. 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 a high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).
B. Truss Anchors: As indicated on Structural Drawings.
C. Plywood Clips: 3/4" size plywood clips made of extruded aluminum alloy M 6063 T-6 as manufactured by Cleveland Steel Specialty Company, Harlen Metal Products Inc., Simpson Company or equal.

PART 3 — EXECUTION

3.1 General:
A. Discard units of material with defects that might impair quality of work, and units that are too small to use in fabricating work with minimum joints or optimum joint arrangement.
B. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.
C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.
D. 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 wood; predrill as required.
E. 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.

3.2 Installation of Wood Framing:

A. Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of "Manual of House Framing" of National Forest Products Association.

B. Anchor and nail as shown, and comply with "Recommended Nailing Schedule" of "Manual of House Framing" and other recommendations of N.F.P.A.

C. Securely attach carpentry work to substrates and supporting members using fasteners of size that will not penetrate members where opposite side will be exposed to view or receive finish materials. Install fasteners without splitting wood; fasten panel products to allow for expansion at joints unless otherwise indicated.

D. Provide wood framing members of size and spacing indicated; do not splice structural members between supports. Firestop concealed spaces with wood blocking not less than 2" thick, if not blocked by other framing members.

E. Provide continuous row of horizontal 2" x 4" blocking at midpoint of all walls and partitions or where shown on the Drawings.

F. Studs, joists and rafters shall be 16" o.c. except where otherwise indicated. Double all top plates, double jambs and heads of all openings, triple all corners, unless noted otherwise.

3.3 Installation of Plywood:

A. General: Comply with applicable recommendations contained in Form No. # 304 "APA Design/Construction Guide - Residential and Commercial", for types of plywood products and applications indicated.

B. Nail plywood or composition sheathing 6" o.c. at edges of panels, and 12" o.c. at intermediate supports. Leave space between panels as recommended by APA.

END OF SECTION 06 10 00

SECTION 06 17 53 — SHOP-FABRICATED WOOD TRUSSES

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all fabricated wood trusses indicated on Drawings and specified herein.
- B. Types of prefabricated wood trusses include:
  1. Wood roof trusses.
  2. Wood girder trusses.
  3. Wood truss bracing.
  4. Metal truss accessories.
- C. Plywood roof sheathing is specified in Section 06 10 00 - Rough Carpentry.

1.3 Definitions:
- A. Prefabricated wood trusses include planar structural units consisting of metal plate connected members which are fabricated from dimension lumber and which have been cut and assembled prior to delivery to the project site.

1.4 Submittals:
- A. Product Data: Submit fabricator's technical data covering lumber, metal plates, hardware, fabrication process, treatment (if any), handling and erection.
- B. Submit certificate, signed by an officer of fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.
- C. Shop Drawings: Submit shop drawings showing species, sizes and stress grades of lumber to be used; pitch, span, camber configuration and spacing for each type of truss required; type, size, material, finish, design values, location of metal connector plates; truss to truss connectors; truss to supporting structure connectors; and bearing and anchorage details. Refer to Drawings for additional shop drawing requirements.
  1. To the extent engineering design considerations are indicated as fabricator's responsibility, submit design analysis and test reports indicating loading, section modulus, assumed allowable stress, stress diagrams and calculations, and similar information needed for analysis and to ensure that trusses comply with requirements.
  2. Provide shop drawings that have been signed and stamped by a structural engineer licensed to practice in the state where trusses will be installed.

1.5 Quality Assurance:
- A. TPI Standards: Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:
  1. "Design Specification for Metal Plate Connected Wood Trusses".
  2. "Design Specification for Metal Plate Connected Parallel Chord Wood Trusses".

3. "Commentary and Recommendations for Handling and Erecting Wood Trusses".
4. "Commentary and Recommendations for Bracing Wood Trusses".
5. "Quality Standard for Metal Plate Connected Wood Trusses".

B. Wood Structural Design Standard: Comply with applicable requirements of "National Design Specification for Wood Construction" published by N.F.P.A.

C. Design by Manufacturer: Trusses shall be designed by connector plate manufacturer to support all superimposed dead and live loads indicated, with design approved and certified by a structural engineer licensed to practice in the state where trusses will be installed.

D. Connector Plate Manufacturer's Qualifications: Provide truss connector plates manufactured by a firm which is a member of TPI and which complies with TPI quality control procedures for manufacture of connector plates published by TPI "Quality Standard for Metal Plate Connected Wood Trusses".

E. Fabricator's Qualifications: Provide trusses by a firm which has a record of successfully fabricating trusses similar to type indicated and which complies with the following requirements for quality control:
   1. Fabricator participates in TPI "Quality Assurance Inspection Program" as a licensee authorized to apply TPI marks to trusses.
   2. Fabricator practices a quality control program which complies with, or is comparable to, one published in TPI "Quality Standard Metal Plate Connected Wood Trusses" and which involves inspection by an independent inspection and testing agency acceptable to Architect and authorities having jurisdiction.

1.6 Delivery, Storage, and Handling:

A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses".
   1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
   2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
   3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.7 Coordination:

A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

PART 2 — PRODUCTS

2.1 Manufacturers: Subject to compliance with requirements, provide metal connector plates of one of the following:

A. Alpine Engineered Products, Inc.
B. Cherokee Metal Products, Inc.; Masengill Machinery Company.
C. CompuTrus, Inc.
D. Eagle Metal Products.
E. Jager Building Systems, Inc.
F. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.

G. Robbins Engineering, Inc.
H. TEE-LOK Corporation; a subsidiary of Berkshire Hathaway Inc.
I. Truswal Systems Corporation.

2.2 Lumber:

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Provide dressed lumber, S4S.
   4. Provide dry lumber with 15 percent maximum moisture content at time of dressing.
      a) Grade: No. 2, minimum.
      b) Species: Southern Pine graded under SPIB rules.

2.3 Metal Connector Plates, Fasteners and Anchorages:

A. Connector Plates: Fabricator connector plates from metal complying with the following requirements:
   1. Hot-Dip Galvanized Steel Sheet: Structural (physical) quality steel sheet complying with ASTM A 446, Grade A; zinc coated by hot-dip process to comply with ASTM A 525, Designation G60; minimum coated metal thickness indicated but not less than 0.036".
   2. Electrolytic Zinc-Coated Steel Sheet: Structural (physical) quality steel sheet complying with ASTM A 591, Coating Class C, and, for structural properties, with ASTM A 446, Grade A; zinc-coated by electro-deposition; with minimum coated metal thickness indicated, but not less than 0.047".

B. Fasteners and Anchorages: Provide size, type, material and finish indicated for nails, screws, bolts, nuts and washers and anchoring devices.

2.4 Fabrication:

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
   1. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 — EXECUTION

3.1 Installation:

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated in the truss submittal.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses 24 inches (610 mm) o.c.; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.
   1. Anchor trusses to girder trusses as indicated in the truss submittal.

I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams as indicated in shop drawings.

J. Install wood trusses within installation tolerances in TPI 1.

K. Do not cut or remove truss members.

L. Replace wood trusses that are damaged or do not meet requirements.
   1. Do not alter trusses in field.

END OF SECTION 06 17 53

SECTION 06 20 00 — FINISH CARPENTRY

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all finish carpentry indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Section 06 10 00 – Rough Carpentry, Section 06 41 14 – Wood-Veneer-Faced Architectural Cabinetry, Section 06 66 00 – Custom Ornamental Simulated Woodwork, Section 08 14 23 – Molded-Hardboard-Faced Wood Doors, Section 08 14 33 – Stile and Rail Wood Doors, Section 08 52 14 – Aluminum-Clad Wood Double-Hung Windows, and Section 09 91 00 - Painting.

1.3 Product Delivery, Storage and Handling:
- A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver finish carpentry materials until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.4 Quality Assurance:
- A. Softwood Lumber Standards: Comply with PS 20 and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
- B. Plywood Standard: Comply with PS 1.
- C. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.
- D. Hardwood Plywood Standard: Comply with PS 51.
- E. Woodworking Standard: Architectural Woodwork Institute (AWI) "Quality Standards".

PART 2 — PRODUCTS

2.1 Exterior Finish Carpentry:
- A. Plywood Soffits: 1/2" Fir, APA A-C, Group 1, Exterior grade.

2.2 Composite Wood Trim: Shall be AZEK Trimboards as manufactured by Vycom Corporation, 801 Corey St., Moosic, PA 18507.
- A. Trimboard material shall be free foam cellular PVC material with a small-cell microstructure and density of .55 grams/cm³.
- B. Beadboard soffit material shall be AZEK Beadboard, 1/2" x 6" x lengths required.
- C. Fasteners:

1. Use fasteners designed for wood trim and wood siding (thinner shank, blunt point, full round head) with AZEK.
2. Use stainless steel or hot-dipped galvanized steel fasteners.
3. Staples, small brads and wire nails must not be used as fastening members.

D. Adhesives:
1. Glue all composite trimboard to composite trimboard joints such as window surrounds, long fascia runs, etc., with manufacturer's cellular PVC cement, to prevent joint separation.
2. The glue joint should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.
3. Surfaces to be glued must be smooth, clean, and in complete contact with each other.
4. Consult manufacturer for bonding composite trimboards to other substrates.

E. Sealants:
1. Use urethane, polyurethane or acrylic based sealants without silicone.

2.3 Interior Wood Columns: Shall be Tuscan Plain Shaft Neoclassical Design No. 200 tapered round wood columns with Tuscan Base and Cap, nominal 12" base diameter x 8'-0" H. (see Drawings), paint grade as manufactured by Chadsworth, Inc., 277 North Front Street, Wilmington, NC 28401, (910)763-7600, or approved equal. Columns shall be manufactured with finger-jointed Ponderosa Pine with wood cap and base. Columns shall be sanded, primed and sanded in the factory. Provide half round columns where indicated on the Drawings.

2.4 Interior Finish Carpentry:

A. Standing and Running Trim (For Painted Finishes): FAS Clear Poplar or Clear White Pine manufactured to sizes and patterns (profiles) shown from First Grade lumber and complying with referenced woodworking standard.
1. Moldings that are not designated with a prefix and number on the Drawings shall be obtained from stock or milled sources manufactured to sizes, type and patterns (profiles) shown.

2.5 Fasteners and Anchorages:

A. Provide nails, screws and other anchoring devices of the proper type, size, material and finish for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal specifications.
B. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating (ASTM A 153).

2.6 Fabrication:

A. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry in relation to relative humidity conditions existing during time of fabrication and in installation areas. Provide finish carpentry with moisture content that is compatible with Project requirements.
B. Fabricate finish carpentry to dimensions, profiles and details indicated. Ease edges to radius indicated for the following:
1. Lumber less than 1 inch in nominal thickness: 1/16-inch.
2. Lumber 1 inch or more in nominal thickness: 1/8-inch.

PART 3 — EXECUTION

3.1 Examination:

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 Preparation:

A. Clean substrates of projections and substances detrimental to application.
B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation for a minimum of 24 hours unless longer conditioning recommended by manufacturer.
C. Backprime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Section "Painting."
D. Do not use finish carpentry materials that are unsound, warped, bowed, twisted, improperly treated or finished, not adequately seasoned, or too small to fabricate with proper jointing arrangements.
E. Do not use manufactured units with defective surfaces, sizes, or patterns. Architect to approve material prior to finishing of material.
F. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.
G. Where finish carpentry is not tight to substrate within 1/16" due to substrate that is bowed, caulk and fill gaps to receive same finish material (stained or painted) as trim. Complete this work prior to any finish work, including painting, wallcovering and carpeting.
H. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
I. Install to tolerance of 1/8 inch in 8 feet for plumb and level. Install adjoining finish carpentry with 1/16-inch maximum offset for flush installation and 1/8-inch maximum offset for reveal installation.
J. Coordinate finish carpentry with materials and systems that may be in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
K. Finish in accordance with specified requirements.
L. Refer to Section 09 90 00 - Painting for final finishing of finish carpentry.

3.3 Standing and Running Trim and Rails:

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related standing and running trim and rails. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane back of casings to provide uniform thickness across joints if required.
B. Match color and grain pattern across joints.
C. Drill pilot holes in hardwood prior to nailing or fastening to prevent splitting. Fasten to prevent movement or warping. Countersink nail heads on exposed carpentry work and fill holes. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

3.4 Composite Trimboards:

A. Comply with manufacturer's product catalog installation instructions and product technical bulletin instructions.
B. Cut composite trimboards using carbide tipped blades designed to cut wood.
C. Edge Finishing: Finish edges by sanding, grinding or filing with traditional woodworking tools.
D. Fasteners must be long enough to penetrate the solid wood substrate a minimum of 1-1/2".
E. Use 2 fasteners per every framing member for trimboard applications. Trimboards, 12" or wider, will require additional fasteners per manufacturer's recommendations.
F. Use 2 fasteners per every framing member for trimboard applications. Trimboards, 12" or wider, will require additional fasteners per manufacturer's recommendations.
G. Material must be fastened into a flat, solid substrate.

3.5 Adjusting: Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

3.6 Cleaning: Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 Protection: Provide final protection and maintain conditions that ensure finish carpentry is without damage or deterioration at time of Substantial Completion.

END OF SECTION 06 20 00

SECTION 06 41 16 — PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETRY

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all plastic-laminate-clad architectural cabinetry indicated on Drawings and specified herein.
- B. Related Sections: The following sections contain requirements that relate to this section:
  1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work that is not exposed to view.
  2. Division 6 Section "Finish Carpentry" for carpentry exposed to view that is not specified in this section.
  3. Division 6 Section "Wood-Veneer-Faced Architectural Cabinetry" for Teller Line Cabinetry.

1.3 Submittals:
- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product and process specified in this section and incorporated into items of plastic-laminate-clad architectural cabinetry during fabrication, finishing, and installation.
- C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components. Shop Drawing submittals shall follow the same numbering sequence as the Architectural Drawings.
- D. Plastic laminate samples for verification purposes.
- E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.
- F. Product samples, three each, of each type item to be stained.

1.4 Quality Assurance:
- A. Manufacturer Qualifications: Firm experienced in successfully producing plastic-laminate-clad architectural cabinetry similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- B. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.

C. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.
D. Plastic-laminate-clad architectural cabinetry fabricators requesting approval shall submit evidence of at least 5 years experience and installations for similar type of project. Fabricators shall submit a written request with a detailed list of any deviations from the Contract Documents for approval. Samples may be impounded by Owner and retained until completion of job for verification and compliance with Specifications.

1.5 Delivery, Storage and Handling:
A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soilage and deterioration.
B. Do not deliver woodwork until painting, wet work, grinding and similar operations which could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas meeting requirements specified in "Project Conditions."

1.6 Project Conditions:
A. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.
B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with manufacture of woodwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 — PRODUCTS

2.1 High Pressure Decorative Laminate Manufacturers: Subject to compliance with requirements, provide high pressure decorative laminates indicated on Finish Schedule in Contract Documents by the following:
A. Formica Corp.
B. Nevamar Corp.
C. Wilsonart
Selections will be made from manufacturer's full product line, including solids, woodgrains and patterns.

2.2 Materials:
A. General: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated and, where the

following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. Hardboard: ANSI/AHA A135.4
2. High Pressure Laminate: NEMA LD 3.
3. Medium Density Fiberboard: ANSI A208.2.
4. Particleboard: ANSI A208.1.
5. Softwood Plywood: PS 1.

2.3 Fabrication, General:

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.
B. Fabricate woodwork to dimensions, profiles, and details indicated.
C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.
E. Open-faced cabinets and cabinets with glass doors shall have laminate finish to match exterior face of cabinet on interior faces of cabinets and shelves.
F. Overhead cabinets shall have laminate finish to match exterior face of cabinet on underside of overhead cabinets.
G. Edges shall match exterior cabinet face laminate, including edge laminates that are not "the casework manufacturer's standard edge options." Edge laminate selections shall be made from the plastic laminate manufacturer's full range of options.
H. Toe kicks shall have laminate finish to match exterior face of cabinet.

2.4 Plastic-Laminate-Clad Cabinets (Plastic-Covered Casework):

A. Quality Standard: Comply with AWI Section 400 and its Division 400B "Laminate Clad Cabinets".
B. Grade: Custom.
C. AWI Type of Cabinet Construction: Flush overlay.
D. Laminate Cladding: High pressure decorative laminate complying with the following requirements:
    1. Match color, pattern, and finish indicated on Finish Schedule in Contract Documents.
    2. Plastic laminate selections shall be made from the plastic laminate manufacturer's full range of options.
E. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade.
    1. Horizontal Surfaces: GP-50 (0.050-inch nominal thickness).
    2. Vertical Surfaces: GP-28 (0.028-inch nominal thickness).
    3. Edges: 3mm PVC matching laminate in color, pattern, and finish, to be selected from plastic laminate manufacturer's full product line. Selections shall not be limited to casework manufacturer's standard edging options.
    4. Semiexposed Surfaces: High pressure laminate, CL-20.

5. Tempered Hardboard Panels: Woodwork manufacturer's standard low pressure laminate.

2.5 Cabinet Hardware and Accessory Materials:
A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
B. Hinges: Blum Model 170 Concealed Hinges for 170° opening and flush overlay application. Hinges shall be self-closing.
C. Pulls: To be selected by Architect. Allow $5.00 per pull.
D. Drawer Slides: Blum BS 430E Full Extension Drawer Runners, 100 lb. capacity, white or almond epoxy coated finish as selected by Architect.
E. Shelf Supports: Blum 34.0040 Shelf Supports, nylon with steel pin, in white, almond, brown or clear finish as selected by Architect.
F. Cable Grommets (See interior elevations for locations): Nominal 2-1/2" diameter plastic cable hole cover with breakaway tab in black color.
G. Support Brackets: Shall be as manufactured by Rangine Corporation, 114 Union Street, Millis, Massachusetts 02054, Tel. (800) 826-6006, Fax. (508) 376-8079, Website www.rakks.com or approved equal.
1. Inside Wall Mount Countertop Support Brackets: Rakks EH-1818-FM, 6063 T-6 "T" shaped extruded aluminum countertop support bracket.

2.6 Fasteners and Anchors:
A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.
B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

PART 3 — EXECUTION

3.1 Preparation:
A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
B. Before installing plastic-laminate-clad architectural cabinetry, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 Installation:
A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.
B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

END OF SECTION 06 41 16

SECTION 06 66 10 — MANUFACTURED URETHANE SIMULATED WOODWORK

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of all manufactured urethane simulated woodwork indicated on Drawings and specified herein.

1.3 Delivery, Storage and Handling:

A. Deliver all manufactured urethane simulated woodwork materials in original packaging, unopened with no visible damage.
B. Label each package with product contents, and stock number of contents, with warranty, installation, handling and storage recommendations enclosed or on packaging.
C. Allow for receiving, unloading, handling, and movement to approved storage areas within project, and finally movement to point of installation.
D. Store and protect all materials in accordance with manufacturer's requirements for environmental and physical protection. Protect from high temperatures such as solar heat in storage trailers exposed to direct sun. Allow at least 24 hours for materials to adapt to conditions at project site prior to installation. Protect un-coated portions of high density molded polyurethane materials from ultraviolet exposure.

PART 2 — PRODUCTS

2.1 Manufacturer: Provide Fypon, Ltd. manufactured urethane simulated woodwork products as specifically listed in Articles 2.2 and 2.3 below. Manufacturer can be contacted at Fypon, Ltd., 960 West Barre Road, Archbold, OH 43502, Telephone: (800)446-3040, Fax: (800)446-9373, Website: www.fypon.com.

2.2 Composite Brackets and Trim:

A. Soffit Brackets: Shall be Type 1, Type 2 and Type 3 custom fabricated composite brackets as manufactured by Fypon in accordance with Details 8, 9 and 10/A-6 respectively.
B. Cove Trim: Fypon No. MLD628-8.

2.3 Accessories:

A. Adhesive: Fypon PL Premium adhesive.
B. Sealant: As approved for use with Fypon products.

2.4 Factory Finishes:

A. Provide Fypon, Ltd. protective barrier coat primer, resistant to UV degradation, providing interim UV protection of products which is suitable for field application of oil base or latex finish paints on all polyurethane foam products.

PART 3 — EXECUTION

3.1 Examination:

A. Site Verification of Conditions:
   1. Prior to start of installation, inspect all preceding work to ensure that there are no conditions which will cause an unsatisfactory installation of work involving Fypon, Ltd. products.
   2. Notify Architect in writing of any unacceptable conditions.
   3. Do not install any work involving specified products until unsatisfactory conditions are corrected and acceptable for proper installation of work.
   4. Correct any unacceptable work involving specified products, which was installed over unsatisfactory conditions at no cost to Owner. If Contractor has directed, in writing, that specified products be installed over unacceptable field conditions, this paragraph is void and Contractor accepts the cost of corrective work.

3.2 Preparation:

A. Protection: Protect surrounding and adjacent work to prevent damage to preceding work during execution of this work.
B. Surface Preparation: Perform all preparation necessary for a successful installation of products as specified in installation instructions for product.

3.3 Installation:

A. Obtain manufacturer's instructions for successful installation of work to be preformed. Become knowledgeable on material handling and installation recommendations. Carefully follow printed instructions.
B. Ensure full compliance with manufacturer's instructions in all aspects of tasks required by this work.
C. Coordinate work installing manufacturer's products with other contractors and provide proper accommodation for following work by other trades.
D. Install sealant in accordance with manufacturer's installation recommendations. Use only sealant products, which are approved for use with manufacturer's materials.
E. Install adhesives at joints and for fastening in accordance with manufacturer's recommendations for proper installation of products. Use only adhesives approved for use with manufacturer's materials.
F. Apply finish paint to all exposed surfaces of prime coated materials installed on exterior of project.

3.4 Protection:

A. Install temporary protective materials necessary to prevent significant damage to materials installed in this work. Remove protection when required to permit project completion.

END OF SECTION 06 66 10

SECTION 07 21 00 — THERMAL INSULATION

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all thermal insulation indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Masonry cavity wall insulation is specified in Section 04 20 00 – Unit Masonry.

1.3 Quality Assurance:
- A. Thermal Resistivity: Where thermal resistivity properties or insulation materials are designated by R-values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.4 Submittals: Submit manufacturer's product literature and installation instructions for each type of insulation and vapor retarder material required.

1.5 Delivery, Storage and Handling:
- A. General Protection: Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.
- B. Protection for Plastic Insulation:
  1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
  3. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

PART 2 — PRODUCTS

2.1 Perimeter Insulation (Under slabs on grade): 1" thick extruded polystyrene boards equal to Owens Corning Foamular 250 or approved equal in widths as indicated on the Drawings.

2.2 Batt Insulation (R-19): 6" fiberglass Kraft faced batts as manufactured by Owens-Corning, Manville or approved equal.

2.3 Batt Insulation (R-30): 9" fiberglass Kraft faced batts as manufactured by Owens-Corning, Manville or approved equal.

2.4 Sound Control Blankets: 3-1/2" un-faced fiberglass batts as manufactured by Johns-Manville or approved equal.

PART 3 — EXECUTION

3.1 Installation:

A. General:
   1. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
   2. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.
   3. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

B. Perimeter Insulation: Protect insulation on vertical and horizontal surfaces from damage during backfilling and concrete work. Install in longest possible lengths, butting joints tightly.

C. Installation of Wall Insulation:
   1. Batt Insulation (Metal Stud Walls): Install between metal studs by lapping flanges in accordance with manufacturer's recommendations.
   2. Batt Insulation (Wood Stud Walls): Install between wood studs by lapping flanges and stapling to face of studs in accordance with manufacturer's recommendations.

D. Installation of Sound Control Blankets: Install in accordance with manufacturer's recommendations, completely filling the wall cavity with blankets in widths proper for stud spacing.

E. Installation of Ceiling Insulation:
   1. Install batt insulation between wood joists or trusses by stapling flanges to bottom of chords as required until drywall is installed to provide permanent support.

3.2 Protection:

A. General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work, or where that is not possible, by temporary covering or enclosure.

END OF SECTION 07 21 00

SECTION 07 24 19 — WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of water-drainage exterior insulation and finish system indicated on Drawings and specified herein.
- B. Section Includes:
  1. EIFS-clad drainage-wall assemblies that are field applied over substrate.
- C. Related Requirements:
  1. Section 07 92 00 – Joint Sealants for sealing joints in EIFS with elastomeric joint sealants and for perimeter joints between system and other materials.
  2. Section 09 21 16 – Gypsum Board Assemblies for Exterior Sheathing Board substrate behind the EIFS system.

1.3 Definitions:
- A. Definitions in ASTM E 2110 apply to Work of this Section.
- B. EIFS: Exterior insulation and finish system(s).
- C. IBC: International Building Code.

1.4 Preinstallation Meetings:
- A. Preinstallation Conference: Conduct conference at Project site.

1.5 Action Submittals:
- A. Product Data: For each EIFS component, trim, and accessory, including water-resistive coatings.
- B. Samples: For each exposed product and for each color and texture specified, 8 inches (200 mm) square in size.
- C. Samples for Initial Selection: For each type of finish-coat color and texture indicated.
  1. Include similar Samples of exposed accessories involving color selection.
- D. Samples for Verification: 24-inch- (600-mm-) square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work including custom trim, each profile, and an aesthetic reveal.
  1. Include a typical control joint filled with sealant of color selected, as specified in Section 07 92 00 – Joint Sealants.

1.6 Informational Submittals:
- A. Qualification Data: For Installer.
- B. Manufacturer Certificates: Signed by EIFS manufacturer certifying the following:
  1. EIFS complies with requirements.

2. Substrates to which EIFS is indicated to be attached are acceptable to EIFS manufacturer.
3. Accessory products installed with EIFS, including joint sealants, flashing, water-resistive coatings, trim, whether or not furnished by EIFS manufacturer and whether or not specified in this Section, are acceptable to EIFS manufacturer.

C. Product Certificates: For cementitious materials and aggregates and for insulation and joint sealant, from manufacturer.
D. Product Test Reports: For each EIFS assembly and component for tests performed by a qualified testing agency.
E. Sample Warranty: For manufacturer's special warranty.

1.7 Closeout Submittals:
A. Maintenance Data: For EIFS to include in maintenance manuals.

1.8 Quality Assurance:
A. Installer Qualifications: An installer who is certified in writing by EIFS manufacturer as qualified to install manufacturer's system using trained workers.
B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution, and to set quality standards for fabrication and installation.
1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 Delivery, Storage, and Handling:
A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.
B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.
1. Stack insulation board flat and off the ground.
2. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.10 Field Conditions:
A. Weather Limitations: Maintain ambient temperatures above 40 deg F (4.4 deg C) for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply EIFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1.11 Warranty:
A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of EIFS-clad drainage-wall assemblies that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a) Bond integrity and weathertightness.

b) Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.

2. Warranty coverage includes the following components of EIFS-clad drainage-wall assemblies:
   a) EIFS finish, including base coats, finish coats, and reinforcing mesh.
   b) Insulation installed as part of EIFS including foam build-outs.
   c) Insulation adhesive.
   d) EIFS accessories, including trim components and flashing.
   e) Water-resistive coatings.
   f) EIFS drainage components.
3. Warranty Period: Seven (7) years from date of Substantial Completion.

PART 2 — PRODUCTS

2.1 Manufacturers:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, but are not limited to, the following:
   4. BASF Wall Systems.
   5. Corev America, Inc.
   6. Dryvit Systems, Inc.
   7. Master Wall Inc.
   8. Omega Products International, Inc.
   9. Parex USA, Inc.
   10. Sto Corp.
   11. Total Wall, Inc.

B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with EIFS components.

2.2 Performance Requirements:

A. EIFS Performance: Comply with ASTM E 2568 and ICC-ES AC219 and with the following:
   1. Weathertightness: Resistant to uncontrolled water penetration from exterior, with a means to drain water entering EIFS to the exterior.
   2. Structural Performance: EIFS assembly and components shall comply with ICC-ES AC219 when tested according to ASTM E 2568.
   3. Impact Performance: ASTM E 2568, Standard impact resistance unless otherwise indicated.
   4. Bond Integrity: Free from bond failure within EIFS components or between EIFS and substrates, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
   5. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch (50.8-by-50.8-mm) clean glass substrate; cured for 28 days and shows no growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274.

2.3 EIFS Materials:

A. Primer/Sealer: EIFS manufacturer's standard substrate conditioner designed to protect substrates from moisture penetration and to improve the bond between substrate and insulation adhesive.

B. Water-Resistive Coatings: EIFS manufacturer's standard formulation and accessories for use as water-resistive barriers; compatible with substrate and complying with physical and performance criteria of ASTM E 2570.
C. Flexible-Membrane Flashing: Cold-applied, self-adhering, self-healing, rubberized-asphalt and polyethylene-film composite sheet or tape and primer; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.
D. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; [specifically formulated to be applied to back side of insulation in a manner that creates open vertical channels designed to serve as an integral part of the water-drainage system of the EIFS-clad drainage-wall assembly;]compatible with substrate; with VOC content of 50 g/L or less; and complying with one of the following:
    1. Job-mixed formulation of portland cement complying with ASTM C 150/C 150M, Type I, and polymer-based adhesive specified for base coat.
    2. Factory-blended dry formulation of portland cement, dry polymer admixture, and fillers specified for base coat.
    3. Factory-mixed noncementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.
E. Drainage Mat: Three-dimensional, nonwoven, entangled filament, nylon or plastic, Woven or fused, self-furring, PVC mesh lath mat designed to drain incidental moisture by gravity; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer[with manufacturer's standard corrosion-resistant mechanical fasteners suitable for intended substrate.
F. Molded, Rigid Cellular Polystyrene Board Insulation: Comply with ASTM C 578, Type I; and EIFS manufacturer's requirements for most stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
    1. Aging: Before cutting and shipping, age insulation in block form by air drying for not less than six weeks.
    2. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, according to ASTM E 84.
    3. Dimensions: Provide insulation boards of not more than 24 by 48 inches (610 by 1219 mm) thick or in other thickness indicated, but not more than 4 inches (102 mm) thick or less than the thickness allowed by ASTM C 1397.
    4. Foam Build-Outs: Provide with profiles and dimensions indicated on Drawings.
G. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) according to ASTM E 2098 and the following:
    1. Reinforcing Mesh for EIFS, General: Not less than weight required to meet impact-performance level specified in "Performance Requirements" Article.
    2. Strip Reinforcing Mesh: Not less than 3.75 oz./sq. yd. (127 g/sq. m).
    3. Detail Reinforcing Mesh: Not less than 4.0 oz./sq. yd. (136 g/sq. m).
    4. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd. (244 g/sq. m).
H. Base-Coat Materials: EIFS manufacturer's standard mixture complying with one of the following:
    1. Job-mixed formulation of portland cement complying with ASTM C 150/ C 150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.

2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
3. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.
4. Factory-mixed noncementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.

I. Finish-Coat Materials: EIFS manufacturer's standard acrylic-based coating complying with the following:
1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.
2. Colors: As selected by Architect from manufacturer's full range.
3. Textures: As selected by Architect from manufacturer's full range.

J. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.

K. Water: Potable.

L. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D 1784, manufacturer's standard cell class for use intended, and ASTM C 1063.
1. Casing Bead: Prefabricated, one-piece type for attachment behind insulation, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
2. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
3. Weep Screed/Track: Prefabricated, one-piece type for attachment behind insulation with perforated face leg extended to form a drip and weep holes in track bottom, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg; designed to drain incidental moisture that gets into wall construction to the exterior at terminations of EIFS with drainage.
4. Expansion Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.
5. Windowsill Flashing: Prefabricated type for both flashing and sloping sill over framing beneath windows; with end and back dams; designed to direct water to exterior.

2.4 Mixing:

A. Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

PART 3 — EXECUTION

3.1 Examination:

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Begin coating application only after surfaces are dry.
   2. Application of coating indicates acceptance of surfaces and conditions.

3.2 Preparation:
A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.
B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.
C. Prepare and clean substrates to comply with EIFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.
   1. Concrete Substrates: Provide clean, dry, neutral-pH substrate for insulation installation. Verify suitability of substrate by performing bond and moisture tests recommended by EIFS manufacturer.

3.3 EIFS Installation, General:
A. Comply with ASTM C 1397, ASTM E 2511, and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.4 Substrate Protection Application:
A. Primer/Sealer: Apply over CMU substrates and where required by EIFS manufacturer for improving adhesion of insulation to substrate.
C. Flexible-Membrane Flashing: Install over weather-resistive barrier, applied and lapped to shed water; seal at openings, penetrations, terminations, and where required by EIFS manufacturer. Prime substrates if required and install flashing to comply with EIFS manufacturer's written instructions and details.

3.5 Trim Installation:
A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, at windowsills, and elsewhere as indicated. Coordinate with installation of insulation.
   1. Weep Screed/Track: Use at bottom termination edges, at window and door heads, and at floor line expansion joints of water-drainage EIFS unless otherwise indicated.
   2. Windowsill Flashing: Use at windows unless otherwise indicated.
   3. Expansion Joint: Use where indicated on Drawings.
   4. Casing Bead: Use at other locations.
   5. Parapet Cap Flashing: Use where indicated on Drawings.
   6. <Insert trim and requirements>.

3.6 Drainage Mat Installation:
A. Drainage Mat: Apply wrinkle free, continuously, with edges butted and adhesively secured over water-resistive barrier.

3.7 Insulation Installation:

A. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C 1397 and the following:

1. Apply adhesive to insulation by notched-trowel method, with notches oriented vertically to produce drainage channels that remain functional after the insulation is adhered to substrate.
2. Press and slide insulation into place. Apply pressure over the entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
3. Allow adhered insulation to remain undisturbed for not less than 24 hours, before beginning rasping and sanding insulation or applying base coat and reinforcing mesh.
   a) Steel Framing: 5/16 inch (8 mm).
   b) Concrete and Masonry: 1 inch (25 mm).
4. Apply insulation over substrates in courses with long edges of boards oriented horizontally.
5. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior of panels if possible.
6. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints so no piece of insulation is less than 12 inches (300 mm) wide or 6 inches (150 mm) high. Offset joints not less than 6 inches (150 mm) from corners of window and door openings and not less than 4 inches (100 mm) from aesthetic reveals.
   a) Adhesive Attachment: Offset joints of insulation not less than 6 inches (150 mm) from horizontal and 4 inches (100 mm) from vertical joints in sheathing.
7. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch (1.6 mm) occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
8. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
9. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/16 inch (1.6 mm) from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch (1.6 mm). Prevent airborne dispersal and immediately collect insulation raspings or sandings.
10. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch (19 mm).
11. Install foam build-outs and attach to sheathing.
12. Interrupt insulation for expansion joints where indicated.
13. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.
14. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.

15. After installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches (64 mm) over front and back face unless otherwise indicated on Drawings.
16. Treat exposed edges of insulation as follows:
    a) Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
    b) Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
    c) At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.
17. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and water-resistive barrier.

B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:
1. At expansion joints in substrates behind EIFS.
2. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
3. At floor lines in multilevel wood-framed construction.
4. Where wall height or building shape changes.
5. Where EIFS manufacturer requires joints in long continuous elevations.

3.8 Base-Coat Installation:

A. Waterproof Adhesive/Base Coat: To exposed surfaces of insulation, apply in minimum thickness recommended in writing by EIFS manufacturer over sloped surfaces, windowsills, and foam build-outs.

B. Base Coat: Apply to exposed surfaces of insulation and foam build-outs in minimum thickness recommended in writing by EIFS manufacturer, but not less than 1/16-inch (1.6-mm) dry-coat thickness.

C. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C 1397 and EIFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches (204 mm) of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.

D. Additional Reinforcing Mesh: Apply strip reinforcing mesh around openings, extending 4 inches (100 mm) beyond perimeter. Apply additional 9-by-12-inch (230-by-300-mm) strip reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- (200-mm-) wide, strip reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches (100 mm) on each side of corners.
1. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches (200 mm) wide.
2. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.

F. Foam Build-Outs: Fully embed reinforcing mesh in base coat.

3.9 Finish-Coat Installation:

A. Primer: Apply over dry base coat according to EIFS manufacturer's written instructions.

B. Finish Coat: Apply over dry primed base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by EIFS manufacturer to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.
C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

3.10 Field Quality Control:
A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.
B. EIFS Tests and Inspections: According to ASTM E 2359, ICC-ES AC24, ICC-ES AC219.
C. EIFS will be considered defective if it does not pass tests and inspections.
D. Prepare test and inspection reports.

3.11 Cleaning and Protection:
A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive EIFS coatings.

END OF SECTION 07 24 00

SECTION 07 25 00 — WEATHER BARRIERS

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all weather barriers indicated on Drawings and specified herein.
- B. Section Includes:
  1. Building wrap.
  2. Flexible flashing.
- C. Related Work Specified Elsewhere:
  1. Section 06 10 00 – Rough Carpentry.

1.3 Submittals:
- A. Product Data: For each type of product.
  1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

PART 2 — PRODUCTS

2.1 Water-Resistive Barrier:
- A. Building Wrap: Shall be DuPont Tyvek® Commercial Wrap®, ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
  1. Water-Vapor Permeance: 20 perms (1150 ng/Pa x s x sq. m) per ASTM E 96/ E 96M, Desiccant Method (Procedure A).
  2. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg (0.02 L/s x sq. m at 75 Pa) when tested according to ASTM E 2178.
  3. Allowable UV Exposure Time: Not less than three months.
  4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 Flexible Flashing:
- A. Butyl Rubber, Flexible Flashing: Shall be DuPont Flexwrap™ NF, Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 70 mil.
- B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

2.3 Miscellaneous Materials:
A. Nails and Staples: ASTM F 1667.

PART 3 — EXECUTION

3.1 Water-Resistive Barrier Installation:
A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
B. Cover sheathing with water-resistive barrier as follows:
1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.
C. Building Wrap: Comply with manufacturer's written instructions.
1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.2 Flexible Flashing Installation:
A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
B. Prime substrates as recommended by flashing manufacturer.
C. Lap seams and junctures with other materials at least 4 inches (100 mm) except that at flashing flanges of other construction, laps need not exceed flange width.
D. Lap flashing over water-resistive barrier at bottom and sides of openings.
E. Lap water-resistive barrier over flashing at heads of openings.
F. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 07 25 00

SECTION 07 31 13 — ASPHALT SHINGLES

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of all shingles and underlayment indicated on Drawings and specified herein.

1.3 Submittals:
- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of asphalt shingle indicated.
  1. Include similar Samples of trim and accessories involving color selection.

1.4 Quality Assurance:
- A. Installer Qualifications: A firm or individual that is approved, authorized, or licensed by asphalt shingle roofing system manufacturer to install roofing system indicated.
- B. Source Limitations: Obtain ridge and hip cap shingles through one source from a single asphalt shingle manufacturer.

1.5 Delivery, Storage and Handling:
- A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double-stack rolls.
  1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.6 Project Conditions:
- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt shingle roofing to be performed according to manufacturer's written instructions and warranty requirements.

1.7 Warranty:
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials within specified warranty period. Materials failures include manufacturing defects and failure of asphalt shingles to self-seal after a reasonable time.
  1. Material Warranty Period: 40 years from date of Substantial Completion, prorated, with first 5 years non-prorated.

1.8 Maintenance Stock: Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
A. Asphalt Shingles: 100 sq. ft (9.3 sq. m) of each type, in unbroken bundles.

PART 2 — PRODUCTS

2.1 Fiberglass Shingle Roofing: GAF Timberline Prestique High Definition shingle with lifetime limited warranty, Class "A", UL labeled, fiberglass based shingles or prior approved equal. Shingles shall comply with ASTM specifications D3018, Type-1; D3161, Type 1; and the requirements of ASTMD 3462. Color shall be as selected by Architect from manufacturer's standard selections.

2.2 Ridge Vents: Air Vent Ridge Shinglevent as manufactured by Air Vent, Inc., Peoria Heights, IL or approved equal. Vents shall be fabricated from molded 0.080" thickness high density linear polyethylene in Black, Brown or White color as selected by Architect. The vent shall have a weather filter of dry glass fiber media based on ASHRAE Standard 52-68 with a resistance of 0.06 WG @ 300 FPM. The vent shall provide 18 sq. in. of net free area per linear foot.

2.3 Underlayment Materials:
A. Sheet Membrane Underlayment (Where Indicated at Eaves, Rakes, Valleys, Hips, and Ridges): ASTM D 1970, minimum of 40-mil- (1.0- mm-) thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.
1. Available Products:
a) Carlisle Coatings & Waterproofing, Div. of Carlisle Companies Inc.; Dri-Start "A."
b) Grace, W. R. & Co.; Grace Ice and Water Shield.
c) Johns Manville International, Inc.; Roof Defender.
2. Owens Corning; WeatherLock M.
B. Felts: ASTM D 226, 30 lb., asphalt-saturated organic felts, nonperforated.

2.4 Accessories:
A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.
1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized steel wire with low profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

PART 3 — EXECUTION

3.1 Examination:

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
   3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Underlayment Installation:
A. Self-Adhering Sheet Underlayment (Where Indicated at Eaves, Rakes, Valleys, Hips, and Ridges): Install self-adhering sheet underlayment, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below and on the Drawings, lapped in direction to shed water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.
   1. Eaves: Extend from edges of eaves 24 inches (600 mm) beyond interior face of exterior wall.
   2. Rakes: Extend from edges of rake 24 inches (600 mm) beyond interior face of exterior wall.
   3. Valleys: Extend from lowest to highest point 18 inches (450 mm) on each side.
   4. Hips: Extend 18 inches (450 mm) on each side.
   5. Ridges: Extend 36 inches (914 mm) on each side without obstructing continuous ridge vent slot.
B. Single-Layer Felt Underlayment: Install single layer of felt underlayment on roof deck perpendicular to roof slope in parallel courses. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt underlayment nails.

3.3 Installation:
A. Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual".
B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed with self-sealing strip face up at roof edge.
   1. Extend asphalt shingles 1/2 inch (13 mm) over fascia at eaves and rakes.
C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
D. Fasten asphalt shingle strips with a minimum of six roofing nails located according to manufacturer's written instructions.
   1. When ambient temperature during installation is below 50 deg F (10 deg C), seal asphalt shingles with asphalt roofing cement spots.

E. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
F. Ridge Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

3.4 Cleanup: Replace any damaged shingles and remove shingle installation debris from the site.

END OF SECTION 07 31 13

SECTION 07 62 00 — SHEET METAL FLASHING AND TRIM

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of sheet metal flashing and trim indicated on Drawings and specified herein.
- B. The types of work specified in this section include the following:
  1. Exposed metal trim
  2. Miscellaneous sheet metal accessories
  3. EPDM flashing
- C. Related Work Specified Elsewhere: Section 07 71 23 – Aluminum Fabrications.

PART 2 — PRODUCTS

2.1 Prefinished Sheet Metal Flashing and Trim: 24 gauge (up to 12" wide) or 22 gauge (13" to 18" wide) prefinished Galvalume steel with baked-on Kynar 500 finish in sizes and shapes indicated on the Drawings.

2.2 Fasteners: Same metal as flashing/sheet metal or other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened. Nails for galvanized flashing and trim shall be needle point nails, length to penetrate nailers at least 1". Exposed fasteners for counterflashing and coping shall be galvanized or stainless steel screws, length to penetrate nailers at least 1", with neoprene washer under head. Washer shall be of sufficient size to cover predrilled slotted holes spaced @ 2'-0" o.c.

2.3 EPDM Flashing: 45 mil non-reinforced flexible, black elastic, EPDM sheet flashing.

2.4 Solder: 50-50 tin/lead solder (ASTM B-32), with rosin flux.

2.5 Bituminous Coating: FS TT-C-294 or SSPC-Paint 12, solvent type bituminous mastic, normally free of sulfur, compounded for 15-mil dry film thickness per coat.

2.6 Sealant: Shall be as manufactured by G.E., Dow Corning or Rhone-Poulene and equal to G.E. "Silpruf" Silicone Sealant, one-part, clear.

PART 3 — EXECUTION

3.1 Fabrication:
- A. Fabricate all members by brake forming, using stock lengths.

B. All completed joints shall be watertight.

3.2 Installation:

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual." Anchor units or thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seam which will be permanently watertight and weatherproof.

B. Isolation: Where metal surfaces of units are to be installed in contact with dissimilar metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces.

3.3 Cleaning and Protection:

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration other than natural weathering, at time of substantial completion.

END OF SECTION 07 62 00

SECTION 07 71 23 — ALUMINUM FABRICATIONS

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all aluminum fabrications indicated on the Drawings and specified herein.
- B. The types of work specified in this section include the following:
  1. Aluminum gutters and downspouts
- C. Related Work Specified Elsewhere: Section 07 31 13 – Asphalt Shingles.

1.3 Submittals:
- A. Product Data: Submit specifications, installation instructions, and general recommendations from manufacturer, including data that materials comply with requirements.
- B. Samples: Full range of samples of color and texture selection for verification of each color/style/texture selected.

1.4 Product Handling: Store aluminum fabrications at site to prevent warping and weather damage, elevating above ground on level blocking and covering to prevent water damage and to permit adequate ventilation within bundles.

1.5 Job Conditions:
- A. Substrate: Proceed with work only after substrate construction and penetrating work have been completed.
- B. Weather Conditions: Proceed with work only when substrate is completely dry.

PART 2 — PRODUCTS

2.1 Aluminum Gutters and Downspouts: Shall be Alcoa Rain Removal System or approved equal:
- A. Gutters shall be Traditional Select 6" made of .032" gauge, 3005-H25 Aluminum Sheet or equivalent.
- B. Downspouts shall be nominal with 3" x 4" corrugated, .027" gauge.
- C. Roof aprons shall be .027" gauge.
- D. End caps shall be .024" gauge.
- E. Inside and outside miters shall be .032" gauge.
- F. Sealant material shall be Alcoa Gutterseal.
- G. Expansion joint to be aluminum lined with neoprene.
- H. Downspout clip shall be .024" gauge.
- I. Gutter hangers to be OG11.
- J. Prior to factory painting, the metal shall receive a special cleaning process to assure maximum paint adhesion. The inside of all gutters and downspouts shall be coated

with a special gold-color corrosion-inhibiting finish. The exterior shall be a two-coat acrylic applied in a two-phase operation, which includes a corrosion-inhibiting primer and a baked-on high-performance acrylic topcoat.

PART 3 — EXECUTION

3.1 Examination:
- A. Examine substrate conditions before beginning installation of gutters and downspouts; verify dimensions and acceptability of substrate.
- B. Do not proceed with installation until unacceptable conditions have been corrected.

3.2 Installation:
- A. General: Comply with instructions and recommendations of gutter and downspout, manufacturer, except to extent more stringent requirements are indicated.
- B. Caulk butt joints at inside and outside corners and at trim locations.
- C. Conceal fasteners to greatest extent possible, by concealing with applied trim as detailed and with head prefinished to match soffit at exposed locations.
- D. Paint or otherwise protect dissimilar metals in contact.

3.3 Adjusting and Cleaning:
- A. Clean dirt from surface of installed products, using mild soap and water.
- B. After completing installation, remove from project site excess materials and debris resulting from installation.

END OF SECTION 07 71 23

SECTION 07 92 00 — JOINT SEALANTS

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of all joint sealants indicated on Drawings and specified herein.

1.3 Quality Assurance:
A. General Performance: Except as otherwise indicated, joint sealers are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application. Failure of installed sealers to comply with this requirement will be recognized as failure of materials and workmanship.

1.4 Submittals: Submit sealant color cards for selection by Architect.

PART 2 — PRODUCTS

2.1 Caulking: Shall be as manufactured by Dap or Pecora and shall be equal to Pecora "AC-20 Acrylic Latex Caulk."

2.2 Sealants: Shall be as manufactured by Tremco, Dap, or Pecora and shall be equal to Tremco "Mono" 1-Part Acrylic Terpolymer. Color as selected by Architect from manufacturer's standard colors.

2.3 Backer Rods: Shall be an extruded, closed cell polyethylene foam.

2.4 Firestop Caulking and Wrap/Strip:
A. Firestop Caulking: Shall be 3M Fire Barrier CP 25WB+ Caulk or approved equal.
B. Firestop Wrap/Strip: Shall be 3M Fire Barrier FS-195+ Wrap/Strips or approved equal.

PART 3 — EXECUTION

3.1 Sealant and Caulking Locations:
A. Caulking: Install at interior hollow metal frames, aluminum windows, wood windows and other voids as necessary to ensure uniform surface finish.
B. Sealants: Perimeter of door, window and glazing frames and other openings in exterior walls. Apply solid bead under all aluminum thresholds.

3.2 Joint Preparation:

A. Clean joint surfaces immediately before installation of sealant or caulking compound. Remove dirt, insecure coatings, moisture and other substances that could interfere with bond sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.
B. Prime or seal joint surfaces where indicated, and where recommended by sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

3.3 Installation:
A. Set joint filler units at proper depth or position in joint to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.
B. Install sealant backer rod for liquid elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated.
C. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally to a lightly concave surface, slightly below adjoining surfaces. Where horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture or dirt.
D. Install sealant to depths as shown, or if not shown, as recommended by sealant manufacturer.
E. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.

3.4 Firestop Installation:
A. Install the firestop in accordance with UL System W-L-1001 for 1-hour fire rated wood stud/gypsum drywall partition.
B. Wood Stud/Gypsum Drywall Applications:
1. Install the firestop symmetrically on both sides of the wall assembly.
2. Annular space requirements: 1/4 to 3/8 in.
3. Slide one FS-195+ Wrap/Strip into the opening, leaving a maximum 3/4 in. exposed wrap beyond the wall surface. If the annular space is greater than 1/4 in. add additional wraps of FS-195+ Wrap/Strip until annular space is less than 1/4 in. FS-195 Wrap/Strips may be friction fit into the opening or secured with foil tape or 16-gauge steel tie wire.
4. Apply a minimum 1/4 in. diameter continuous bead of CP 25WB+ Caulk to the wrap/strip/wall interface and to the exposed edge of the wrap/strip layer approximately 3/4 in. from the wall surface.

3.5 Cure and Protection: Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise Contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion.

END OF SECTION 07 92 00

SECTION 08 11 13 — HOLLOW METAL DOORS AND FRAMES

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of hollow metal doors and frames indicated on Drawings and specified herein.

1.3 Submittals: Submit shop drawings indicating location and size of each door and frame and including manufacturer's standard details.

1.4 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. Manufacturer: Provide standard hollow metal doors and frames by a single firm specializing in production of this type of work. Provide hollow metal doors and frames by one of the following:

1. Ceco Corp.
2. Republic Builders Prod. Corp.
3. SteelCraft Mfg. Co.

Ceco product numbers are used for reference only.

PART 2 — PRODUCTS

2.1 Insulated Metal Doors:

A. Republic "Embossed Panel Doors" 4 panel design or prior approved equal.

B. Fabricated of 18 heavy-duty gauge steel face sheets and 16 gauge flush top and bottom channels.

1. Provide A60 galvanized face sheets and channels. Provide silicone sealant at top channel of the galvanized door.

C. Core shall be completely filled with rigid urethane formed in place and chemically bonded to all interior door surfaces.

D. Doors shall be fabricated with sill clearances to allow for thresholds as specified where thresholds are indicated.

E. Shop paint exposed surfaces using manufacturer's standard baked-on rust inhibitive primer.

F. Close top and bottom edges of exterior doors as integral part of door construction or by addition of inverted steel channels.

2.2 Welded Metal Frames:

A. Exterior frames shall be fabricated from 16-gage galvanized steel.

B. Fabricated of 16 gauge sheet steel and of dimensions and shapes indicated on the Drawings.
C. Joints shall be mitered at intersection of head and jambs and shall be continuously factory arc-welded for full depth and width of frame with all welds ground smooth.
D. Furnish with appropriate anchors required for wall construction in which the frames are to be installed.
E. Door frames shall be punched to receive rubber or vinyl silencers. Provide 2 silencers on lock side of single doors.
F. Shop paint exposed surfaces using manufacturer's standard baked-on rust inhibitive primer.
G. Prep frames at strike for future installation of electronic strike.

2.3 Hardware Preparation: Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping, complying with ANSI A 115, "Specifications for Door and Frame and Preparation for Hardware".

PART 3 — EXECUTION

3.1 Inspection: Installer must examine substrate and conditions under which steel doors and frames are to be installed and must notify Contractor in writing of any conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 Installation:
A. General: Install standard hollow metal doors, frames and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.
B. Placing Frames:
1. Comply with provision of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.
2. Place frames prior to construction of enclosing walls and ceiling. 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.
3. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels. Building-in of anchors and grouting of frames is specified in Division 4.
4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
C. Door Installation: Fit hollow metal doors accurately in frames; within clearances specified in SDI-100.

3.3 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. 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 11 13

SECTION 08 14 23 — MOLDED-HARDBOARD-FACED WOOD DOORS

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all molded interior wood doors indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere:
  1. Section 06 20 00 – Finish Carpentry.
  2. Section 08 71 00 – Door Hardware.

1.3 References and Regulatory Requirements:
- A. ASTM E152 - Methods of Fire Tests and Door Assemblies
- B. NFPA 252 - Standard Methods for Fire Assemblies
- C. UBC 7-2, 1997
- D. UL 10 (b) - Fire Tests for Door Assemblies - Neutral Pressure
- E. UL 10 (c) - Fire Tests for Door Assemblies - Positive Pressure
- F. NFPA 80 - Fire Doors and Windows
- G. Labeling Agencies:
  1. Intertek Testing Services-Warnock Hersey (ITS-WH) (Ratings for both Neutral and Positive Pressure rated doors).

1.4 Quality Assurance:
- A. Manufacturer: Obtain doors from a single manufacturer to ensure uniformity in quality of appearance and construction, unless otherwise indicated.

1.5 Submittals:
- A. Product Data: Indicate door core materials, thickness, construction, and elevation profile.
- B. Shop drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts, special beveling, blocking for hardware in mineral core doors.
- C. Construction samples: Submit one or more of manufacturer's standard samples demonstrating door construction.
- D. Manufacturer's limited 5-year warranty.

1.6 Product Delivery, Storage and Handling:
- A. Deliver, store, protect and handle products under provisions of WDMA, AWI, WIC and manufacturer's care and handling instructions.
- B. Accept doors on site in manufacturer's standard packaging. Inspect for damage. Do not store in damp or wet areas. HVAC systems should be operating and balanced prior to arrival of doors. Acceptable humidity shall be no less than 25% nor greater than 55%.

1.7 Coordination:
- A. Coordinate the work with door opening construction, door frame and door hardware installation with a pre-installation conference.

1.8 Warranty:
- A. Provide manufacturer's warranty to the following term:
  1. Interior Solid Core Doors: "Limited 5 year Warranty."
  2. Interior Mineral Core Doors: "Limited 5 year Warranty."
  3. Include coverage for delamination, warping, bow, cup and telegraphing of core construction beyond warranty tolerances.

PART 2 — PRODUCTS

2.1 Manufacturer:
- A. Marshfield DoorSystems, Inc., Contour Series or prior approved equal.

2.2 Materials:
- A. Contour Molded Skin Facing:
  1. Atherton, 4-panel, smooth surface with Ovolo sticking.
  2. Neutral and Positive Pressure rated fire doors.

2.3 Fabrication:
- A. Door Construction:
  1. Non-rated: ANSI A208; 1-LD-1 Particleboard, WCPC-1.
  2. 20-minute fire-rated: ANSI A208.
- B. Vertical Edges (Stiles):
  1. Non-rated:
     a) 1-3/4" thick 1-1/4" wood stiles
  2. 20 minute neutral and positive pressure 1-3/4" doors
     a) 1-1/4" wood stiles
  3. Mineral Core:
     a) 1-3/4" thick 1-1/4" wood stiles
     b) As required by manufacturer to meet B (frame mounted intumescent).
- C. Horizontal Edges (Rails):
  1. Manufacturer's standard.
  2. As required to meet positive pressure ratings.
- D. Machining:
  1. Factory fit and machine doors for frame and finish hardware in accordance with hardware and NFPA 80 requirements and dimensions. Do not machine for surface hardware. Apply appropriate fire labels.

PART 3 — EXECUTION

3.1 Examination:
- A. Verify that opening sizes and tolerances are acceptable and ready to receive this work.
- B. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.2 Installation:

A. Install fire-rated and non-rated doors in accordance with NFPA 80, manufacturers' instructions and to ITS-WH/UL requirements.
B. Trim non-rated door width by cutting equally on both jamb edges.
C. Trim door height by cutting bottom edges to a maximum 3/4 inch (19-mm).
D. Trim fire door height at bottom edge only, in accordance with fire rating requirements.
E. Do not trim positive pressure rated doors for width.
F. Pilot drill screw and bolt holes using templates provided by hardware manufacturer.
G. Exercise caution when drilling pilot holes and installing hinges so that pilot holes are not over drilled and screws are not over torqued. Follow manufacturer's installation instructions for positive pressure doors.
H. Coordinate installation of doors with installation of frames and hardware.
I. Coordinate installation of glass and glazing.
J. Install door louvers and light kits plumb and level.
K. Reseal or refinish any doors that required site alteration.
L. Condition doors to average prevailing humidity in installation areas prior to hanging.
M. Hardware: For installation see Section 08 71 00 - Door Hardware of these Specifications.
N. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions and as indicated on Drawings.
O. Job Fit Doors: Align doors to frame for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining. Bevel doors 1/8" in 2" at lock and hinge edges.
P. Clearances: Provide clearances of 1/8" at jambs and heads; 1/8" at meeting stiles for pairs of doors; and 1/2" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.
Q. Job Site Finished Doors: See Section 09 91 00 - Painting of these Specifications for requirements for finishing wood doors.

3.3 Adjust and Clean:

A. Operation: Rehang or replace doors that do not swing or operate freely, as directed by Architect.
B. Finished Doors: Refinish or replace doors damaged during installation, as directed by Architect.
C. Protection and Completed Work: Advise Contractor of proper procedures required for protection of installed wood doors from damage or deterioration until acceptance of work.

END OF SECTION 08 14 23

SECTION 08 14 33 — STILE AND RAIL WOOD DOORS

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of all stile and rail wood doors indicated on Drawings and specified herein.

1.3 Quality Assurance:

A. NWMA Quality Marking: Mark each wood door with NWMA Wood Flush Door Certification Hallmark certifying compliance with applicable requirement of ANSI/NWMA I.S. 1 Series. For manufacturers not participating in NWMA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

B. Manufacturer: Shall be a company specializing in the manufacture of stile and rail doors specified in this section for a minimum of 10 years. All stile and rail doors specified in this section Wood doors shall be supplied and manufactured by one company. All details including panels, sticking and profiles shall match. Plant-ons for fire doors will not be accepted.

C. Pre-Installation Meeting: Prior to the doors being unwrapped from the factory packaging a meeting shall take place with the factory representative or the door manufacturer and the general contractor, door distributor, installers, finishers and any other trades responsible for the handling of the doors, to review the factory Care and Handling and Finishing Instructions.

1.4 References: Comply with the applicable requirements of the following standards unless otherwise indicated:

A. ANSI NWMA I.S. 1, "Industry Standard for Wood Flush Doors" published by National Woodwork Manufacturers Association (NWMA).

B. AWI Quality Standard: Section 1300 of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI). Designations for grade and core construction under types of doors refer to this standard.

1.5 Submittals:

A. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking and other pertinent data.

1.6 Warranty:

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty

is in addition to and not a limitation of, other rights Owner may have under the Contract Documents.

1. Include coverage for warping beyond specified installation tolerances or defective material. Warranty includes replacement only, not installation or freight.
2. Warranty Period: 5 years.

1.7 Product Delivery, Storage and Handling: Doors shall be stored and handled in accordance with the manufacturer's recommendations and the WDMA – Appendix Section – "Care and Installation at Job Site".

A. Doors shall be stored on a flat and level surface in a well ventilated dry building. Doors shall not be stored on edge and shall be protected from dirt, water and abuse.
B. Protect doors from exposure to light for veneers which are light sensitive.
C. Doors shall not be subjected to extreme heat or humidity. HVAC systems should be set to provide a temperature range of 60 -90 degrees F and 25-55% relative humidity.
D. Handle doors with clean hands or gloves. Do not drag doors across floors or other surfaces.
E. Each Door shall be marked with the opening number.

PART 2 — PRODUCTS

2.1 Manufacturer: Shall be as manufactured by TruStile Doors, LLC, 1780 East 66th Ave., Denver, CO 80229, Tel. (866) 442-5302, Website: www.trustile.com; or prior approved equal.

A. Approved equal products, subject to compliance with the design and performance of this specification and as approved by Owner and Architect in accordance with Section 01 60 00.

2.2 Door Construction:

A. Description:
   1. Type: TruStile WTS Series Wood veneered doors.
   2. Veneer: Veneers 1/16" in thickness for interior and exterior doors.
      a) Species: African Mahogany.
      b) Grade: Stain Grade.
      c) Cut: Quarter sawn.
      d) Thickness: 1-3/4"
   3. Size and Types: See Drawings for sizes. Types are listed below:
      a) Type 'FG' Wood/Glass Doors: Shall be Trustile custom FL810, 1-3/4" thick, Mahogany doors for exterior use in sizes indicated on the Drawings. Top panel shall be glazed with 1/4" tempered glass.
      b) Provide matching transom panels over exterior pair only in accordance with Wood Door Frame Elevation Drawing WD-4 indicated on Drawing A-3.
B. Stile and Rail (Sticking) Type: Reverse Roman Sticking (OG).
C. Panel Type:
   1. Beveled Panel (Panel A).
   2. Panels shall be constructed of MDF core with solid wood panels laminated to both sides or solid wood to match profile specified. Panels shall float inside the sticking in true stile and rail construction. Panels shall be held in place by the sticking and flexible bumper shall be installed inside sticking to keep panel centered.

3. Panel Thickness: 1-1/4".

2.3 Fabrication:
A. Machining for Door Hardware: All doors shall be machined for specified hardware that is not surface applied.
B. Prefit and Bevel Doors 1/8" in 2" at lock stile.
C. Doors shall be factory glazed with glass as specified unless otherwise indicated.
D. Machining for surface hardware or function holes in the field is allowed.
E. Thru-bolts to be used for surface hardware attachment.
F. Factory pre-fit doors for frame opening dimensions identified on shop drawings.
G. Fabrication tolerances for doors machined for hardware shall be as follows:
1. Thickness: +/- 1/32" (0.8 mm).
2. Length: +/- 1/32" (0.8 mm).
3. Width: +/- 1/32" (0.8 mm).
4. Squareness: Diagonally measured, not to exceed 1/16" (1.6 mm).

PART 3 — EXECUTION

3.1 Inspection: Installer must examine door frames and verify that frames are correct type and have been installed as required for proper hanging of corresponding doors and notify Contractor in writing of conditions detrimental to proper and timely installation of wood doors. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 Installation:
A. Condition doors to average prevailing humidity in installation areas prior to hanging.
B. Hardware: For installation see Division 8 - "Door Hardware" section of these specifications.
C. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions and as shown.
D. Job Fit Doors: Align doors to frame for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining. Bevel doors 1/8" in 2" at lock and hinge edges.
1. Clearances: Provide clearances of 1/8" at jambs and heads; 1/8" at meeting stiles for pairs of doors; and 1/2" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.
2. Bevel doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
E. Job Site Finished Doors: See painting sections in Division 9 of these Specifications for requirements for finishing wood doors.

3.3 Adjust and Clean:
A. Operation: Rehang or replace doors that do not swing or operate freely, as directed by Architect.
B. Finished Doors: Refinish or replace doors damaged during installation, as directed by Architect.

C. Protection and Completed Work: Advise Contractor of proper procedures required for protection of installed wood doors from damage or deterioration until acceptance of work.

END OF SECTION 08 14 33

SECTION 08 52 00 — ALUMINUM-CLAD WOOD DOUBLE HUNG WINDOWS

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all aluminum-clad wood double hung windows indicated on Drawings and specified herein.
- B. Related Sections:
  1. Section 06 10 00 - Rough Carpentry.
  2. Section 06 20 00 - Finish Carpentry: Installation of trim furnished by window manufacturer.
  3. Section 07 92 00 - Joint Sealers: Sill sealant and perimeter caulking.
  4. Section 09 91 00 - Painting: Paint or stain finish other than factory applied finish.

1.3 Performance Requirements:
- A. General: Perform testing in accordance with AAMA/WDMA/CSA 101 I.S.2/A440.
- B. Forced Entry: When tested in accordance with ASTM F588.

1.4 Submittals:
- A. Product Data: Submit manufacturer's printed product data, test reports and installation instructions.
- B. Shop Drawings: Submit shop drawings for approval. Include detailed plans, elevations, details, required rough openings, anchors and accessories. Include relationship with adjacent materials. Provide installation templates for work installed by others.
- C. Samples: Submit representative samples of each material that is to be exposed in the completed work. Show full color ranges and finish variations expected.

1.5 Quality Assurance:
- A. Manufacturer: For each material type required for the work of this section, provide primary materials that are the product of one manufacturer. Provide secondary or accessory materials that are acceptable to the manufacturers of the primary materials.
- B. Installer: A firm with a minimum of three years experience in type of work required by this Section.
- C. Mock-Up: Prior to commencing the primary work of this section, provide a mock-up of each unit type at locations acceptable to Architect. Obtain Architect's acceptance of visual qualities. Remove and replace units that are not approved. Approved mock-ups built in place may be incorporated into the finished work.

1.6 Delivery, Storage and Handling:

A. Deliver materials and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.
B. Handling: Protect materials and finish during handling and installation to prevent damage.
C. Prime or seal wood surfaces, including surface to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation.

1.7 Warranty:
A. Provide manufacturer's standard limited warranty covering the following:
1. Structural members and operating hardware are warranted against defects in material and workmanship for a period of ten years.
2. Loewen warrants all wood components on metal clad products against defects in materials or workmanship that affect product performance for a period of twenty (20) years from the date of original purchase.
3. Insulating glass is warranted against material obstruction of transparency resulting from film formation or dust collection on the interior surfaces for a period of ten years and twenty years on qualifying Heat Smart Systems.

PART 2 — PRODUCTS

2.1 Acceptable Manufacturer:
A. Provide units manufactured by Loewen, Inc., 77 Highway 52 West, Steinbach, Manitoba R5G 1B2; 204-326-6446; 800-563-9367; www.loewen.com.

2.2 Aluminum-Clad: Hung Window Units:
A. Aluminum-Clad Hung Window Units: Preglazed with insulating glass; Double Hung window tested to CSA/AAMA/WDMA/CSA 101 I.S-2/A440. Tested for Air Leakage, Water Leakage, Wind Resistance/Load.
1. Glass and Glazing Type:
a) Double-glazed Heat Smart X.
2. Hardware: Single hand operated heavy duty cam-lock and concealed tilt latches.
a) Finger pull type sash lifts.
b) Finish: Plated Bright Brass.
3. Grilles:
a) Style: Colonial.
b) Simulated Divided Lites: 3/4" Ogee grille bars permanently applied to the interior and exterior, with or without airspace grilles.
4. Weatherstripping: Flexible bubble and foam filled bulb.

2.3 Materials and Components:
A. Frame and Sash: Coastal Douglas Fir kiln-dried lumber, preservative-treated in accordance with NAFS 1/WDMA 101 I.S.-2/CSA-A440. Interior exposed surfaces are clear wood or factory primed with no visible vinyl jamb liner; exterior surfaces are pre-finished aluminum clad with no visible vinyl jamb liner. Sill is thermally broken. Jamb width 4-9/16 in. (116 mm).
B. Glass and Glazing: Factory sealed units with integral wood glazing stop at interior face.

C. Grilles (Simulated Divided Lites): Manufacturer's standard 3/4" Double Hung Ogee, interior primed wood grilles, permanently mounted, exterior pre-finished aluminum permanently mounted.
D. Finishes:
   1. Exterior Aluminum Finish: Custom color as selected by Architect.
   2. Interior Wood Finish: Latex prime coat, white.

PART 3 — EXECUTION

3.1 Examination:
   A. Verification of Conditions: Before Installation, verify openings are plumb, square, and of proper dimension. Report frame defects or unsuitable conditions to the General Contractor before proceeding.
   B. Acceptance of Conditions: Beginning of installation confirms acceptance of existing conditions.

3.2 Installation:
   A. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section. Coordinate installation with adjacent work to ensure proper sequence of construction, clearances and support.
   B. Install units plumb, level, complete with drip flashing and in proper relationship with adjacent work. Install without twisting, bowing or springing. Anchor units securely in place.
   C. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07 92 00 – Joint Sealants. Do not use expansive foam sealant.
   D. Install accessory items as required.

3.3 Cleaning and Protection:
   A. Remove visible labels and adhesive residue from glass according to manufacturer's instructions.
   B. Leave windows and glass in a clean condition.
   C. Protect windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage.
   D. Touch-up damaged coatings and finishes using non-abrasive materials and methods recommended by manufacturer. Eliminate all visible evidence of repair.

END OF SECTION 08 52 00

SECTION 08 52 19 — INTERIOR WOOD WINDOWS

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of all interior wood windows indicated on Drawings and specified herein.

PART 2 — PRODUCTS

2.1 Interior Wood Windows:

A. Sash: The sash is to be manufactured from 1-3/8" thick paint grade Yellow Poplar with mortise and tenon joints, fastened with steel dowel pins.

B. Glazing: DS tempered glass with authentic individual divided lites where indicated in interior window transoms.

C. Finish: Sash and muntins shall be unfinished, allowing for paint finish on the job.

PART 3 — EXECUTION

3.1 Installation:

A. Comply with manufacturer's instructions and recommendations for installation of wood window units, and other components of work.

B. Set units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.

END OF SECTION 08 52 19

SECTION 08 71 00 — DOOR HARDWARE

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all door hardware indicated on Drawings and specified herein.
- B. Cabinet hardware is included in Section 06 41 14 – Wood-Veneer-Faced Architectural Cabinetry and Section 06 41 16 – Plastic-Laminate-Clad Architectural Cabinetry.

1.3 Guarantee: Hardware furnished under this section shall be guaranteed for a period of two (2) years against defects in workmanship and material.

1.4 Submittals:
- A. Schedule and Samples: Submit a complete schedule of hardware equipment indicating type, number, location and finish of each item.
- B. Template Hardware: Furnish templates of hardware to manufacturers of equipment requiring use of such templates.
- C. Instructions: Provide manufacturer's installation instructions for each type of hardware.

1.5 Packaging: Each individual piece of hardware shall be packed with screws and fasteners to ensure proper installation. Application templates shall be included. Items shall be identified with reference to hardware schedule and Architect's door designation.

1.6 Manufacturers: Products of the following manufacturers or others will be accepted, if equal in all respects to design, function and quality:
- A. Exit Devices: Corbin/Russwin or approved equal.
- B. Butts: Hager, Stanley, McKinney or approved equal.
- C. Locks and Latches: Corbin/Russwin or approved equal.
- D. Closers: Corbin/Russwin or approved equal.
- E. Push/Pulls/Misc.: Trimco as specified.

PART 2 — PRODUCTS

2.1 Materials and Finish:
- A. Butts: All butts shall be equal to Stanley Type FBB179, F179 and FBB191. All doors with closers to have ball-bearing butts. All butts to be 4-1/2 x 4-1/2 unless noted otherwise, 1-1/2 pair per door. Butts for out-opening exterior doors to have NRP. Finish – US10B, except where noted otherwise.

B. Exit Devices: Corbin/Russwin Series devices and trim as shown in schedule. Russwin ED5200. Finish – US10B, except where noted otherwise.
C. Locks and Latches: Corbin/Russwin function as listed under the hardware sets. Finish – 613.
D. Closers: Sprayed to match finish of hardware. Equal to Corbin/Russwin DC6210 Series, sized per manufacturer's recommendations for door on which used. Furnish with through bolts. Provide parallel arm types where indicated.
E. Push/Pulls: Trimco as listed in Hardware Sets, Finish – 613.
F. Kickplates: 8" high x 2" less than width of door, Finish – 613.
G. Door Stops: US10B; furnish types as specified or as required to suit conditions at each door where needed to prevent door or hardware from hitting obstructions.
H. Silencers: Furnish three (3) each for single door.
I. Miscellaneous Items: US10B finish.

2.2 Keying:
A. All locks shall be masterkeyed to the Bank's existing Corbin/Russwin system now in use. All locks shall be keyed differently except keyed alike groups as directed.
B. Furnish two (2) keys for each differently keyed lock, six keys for each keyed alike set, and four masterkeys.
C. All locks and cylinders to be same manufacturer.

2.3 Hardware Sets: Hardware for doors shall be as listed in the following hardware sets. Hardware scheduled is for each door or pair of doors listed in the set. Hardware for doors not listed shall match other hardware as closely as possible in suitable function and quality.

Hardware Set #1

Pair Doors 102A

Each Pair to have:
6 FBB191 4-1/2 x 4-1/2 US10B
2 Pulls Trimco 50 x 59 613
2 Push Trimco 50 613
1 Mortised Deadlock DL4113 x Masterkeyed Cylinder 613
2 Closers DC6210 M54 M71 690
2 Kickplates 8" x 2" LWD 613
1 Threshold 425BR x length required
1 Set Weatherstripping 120NBR x length required
2 Sweeps 200NBR x length required
2 Stops 444 B10B
2 Surface Bolts Ives 253 x 12" B10B

Hardware Set #2

Doors 115A

Each Door to have:
3 Butts FBB191 4-1/2 x 4-1/2 US10B
1 Exit Device ED5200 x N957 613
1 Closer DC6210 M54 M71 690
1 Masterkeyed Cylinder 613
1 Kickplate 8" x 2" LWD 613
1 Stop 444 B10B
1 Threshold 425BR x length required
1 Sweep 200NBR x length required
1 Door Viewer – Door Scope DS-238 Black Anodized
1 Set Weatherstripping 120NBR x length required

Hardware Set #3

Pair Doors 103A

Each Pair to have:
6 Butts FBB179 4-1/2 x 4-1/2 US10B
2 Push Trimco 50 613
2 Pulls Trimco 50 x 59 613
2 Closers DC6210 M54 M71 690
2 Kickplates 8" x 2" LWD 613
2 Floor Stops Ives FS436 B10B
Silencers

Hardware Set #4

Doors 112A, 128A

Each Door to have:
3 Butts FBB179 4-1/2 x 4-1/2 US10B
1 Lockset CL3557 Armstrong 613
1 Stop as required
Silencers

Hardware Set #5

Doors 104A, 106A, 108A, 111A, 124A, 130A, 132A, 133A

Each Door to have:
3 Butts FBB179 4-1/2 x 4-1/2 US10B
1 Lockset CL3551 Armstrong 613
1 Stop as required
Silencers

Hardware Set #6

Doors 117A

Each Door to have:
3 Butts FBB179 4-1/2 x 4-1/2 US10B
1 Lockset CL3557 Armstrong 613
1 Closer DC6210 M54 M71 690
1 Kickplate 8" x 2" LWD 613
1 Stop as required
Silencers

Hardware Set #7

Doors 113A, 120A, 122A

Each Door to have:
3 Butts FBB179 4-1/2 x 4-1/2 US10B
1 Privacy Set CL3520 Armstrong 613
1 Closer DC6210 M54 M71 690
1 Kickplate 8" x 2" LWD 613
1 Coat Hook Ives 582 A716
1 Stop as required
Silencers

Hardware Set #8

Door 121A, 121B, 123A

Each Door to have:
3 Butts FBB179 4-1/2 x 4-1/2 US10B
1 Passage Set CL3510 Armstrong 613
1 Closer DC6210 M54 M71 690
1 Kickplate 8" x 2" LWD 613
1 Stop as required
Silencers

Hardware Set #9

Doors 116A, 119A

Each Door to have:
3 Butts FBB179 4-1/2 x 4-1/2 US10B
1 Lockset CL3551 Armstrong 613
1 Closer DC6210 M54 M71 690
1 Kickplate 8" x 2" LWD 613
1 Stop as required
Silencers

Hardware Set #10

Door 126A

Each Door to have:
3 Butts FBB179 4-1/2 x 4-1/2 US10B
1 Privacy Set CL3520 Armstrong 613
1 Stop as required
Silencers

Hardware Set #11

Door 127A

Vault Door by Bank Equipment Supplier

PART 3 — EXECUTION

3.1 Installation:

A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in Division 9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

3.2 Adjust and Clean:

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Final Adjustment: Wherever installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

END OF SECTION 08 71 00

SECTION 08 90 00 — LOUVERS AND VENTS

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of louvers and vents indicated on Drawings and specified herein.

1.3 Submittals: Manufacturer's data, shop drawings and installation instructions.

PART 2 — PRODUCTS

2.1 Soffit Vents: Air Vent Model SV201, 2" undereave aluminum soffit vents in 8' lengths and White (WH) Duracron thermoset acrylic enamel finish as manufactured by Air Vent, Inc., Peoria Heights, IL or approved equal.

PART 3 — EXECUTION

3.1 Locate and place louver units plumb, level, in proper alignment with adjoining work, and in accordance with manufacturer's instructions.

3.2 Use non-ferrous metal or galvanized anchors and inserts for exterior installations and elsewhere required for corrosion resistance.

3.3 Repair damaged finishes so that there is no evidence of corrective work.

END OF SECTION 08 90 00

SECTION 09 21 16 — GYPSUM BOARD ASSEMBLIES

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all gypsum board assemblies indicated on Drawings and specified herein.
- 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 screw attached to wood framing and furring members.
  3. Finishing of gypsum board.
- C. Related Work Specified Elsewhere: Section 05 40 00 – Cold-Formed Metal Framing, Section 06 61 00 – Rough Carpentry, Section 09 22 16 – Non-Structural Metal Framing and Section 09 91 00 - Painting.

1.3 Quality Assurance:
- A. Gypsum Board Standard: GA-216 by Gypsum Association.
- B. Fire-Resistance Ratings: Where indicated, provide materials and construction which are identical to those assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

1.4 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.

1.5 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 non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board maintain not less than 50 deg F (10 deg 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.

PART 2 — PRODUCTS

2.1 Manufacturer: Subject compliance with requirements, provide products of one of the following:
- A. Gypsum Boards and Related Products:
  1. Georgia-Pacific Corp.
  2. Gold Bond Building Products Div., National Gypsum Co.
  3. United States Gypsum Co.

2.2 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 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: Type X, unless otherwise indicated.
  2. Edges: Tapered.
  3. Thickness: 5/8 inch, unless otherwise indicated.

2.3 Trim Accessories:
- A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 with formed sheet steel zinc-coated by hot-dip process.
- B. Edge trim shapes shall be "LC" Bead, unless otherwise indicated.

2.4 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.
- C. Joint Compounds: Factory-premixed all-purpose vinyl-based joint compound.

2.5 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.

PART 3 — 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 Application and Finishing of Gypsum Board, General:

A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.

B. 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.

C. 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.

D. Install wall/partition boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At high walls, install boards horizontally with end joints staggered over studs.

E. 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.

F. 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.

G. 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.

H. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

I. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.3 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 vertically (parallel to framing), 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 furring members apply gypsum board vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

B. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

1. Fasten with screws.

3.4 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. Provide type with face flange to receive joint compound.

1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.

3.5 Finishing Gypsum Board Assemblies:

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges.

3.6 Field Quality Control:

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Architect days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
   a) Installation of 80 percent of lighting fixtures, powered for operation.
   b) Installation, insulation, and leak and pressure testing of water piping systems.
   c) Installation of air-duct systems.
   d) Installation of air devices.
   e) Installation of mechanical system control-air tubing.
   f) Installation of ceiling support framing.

3.7 Cleaning and Protection:

A. Promptly remove any residual joint compound from adjacent surfaces.

B. 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 09 21 16

SECTION 09 22 16 — NON-STRUCTURAL METAL FRAMING

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all non-structural metal framing indicated on Drawings and specified herein.
- B. This Section includes non-load-bearing steel framing members for the following applications:
  1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
- C. Related Sections include the following:
  1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
  2. Division 07 Section "Thermal Insulation" for insulation installed with Z-shaped furring members.
  3. Division 09 Section "Gypsum Board Assemblies" for non-load-bearing metal wall framing, gypsum panels, and other components of wall assemblies.

1.3 Submittals:
- A. Product Data: For each type of product indicated.

1.4 Quality Assurance:
- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 — PRODUCTS

2.1 Non-Load-Bearing Steel Framing, General:
- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
  2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

2.2 Steel Framing for Framed Assemblies:

A. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base-Metal Thickness:
      a) 0.0312 inch (0.79 mm), 20 gauge, unless otherwise indicated.
   2. Depth:
      a) 3-5/8 inches (92.1 mm), unless otherwise indicated on the Drawings.
      b) 6 inches (152.4 mm), where indicated on the Drawings.

B. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.
   1. Depth: 1-1/2 inches (38.1 mm).
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.

C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
   2. Depth: 7/8 inch (22.2 mm).

2.3 Auxiliary Materials:

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 — EXECUTION

3.1 Examination:

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation:

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 Installation, General:

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

B. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
   1. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
   2. Install bracing at terminations in assemblies.

3. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 Installing Framed Assemblies:

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.
   1. Space studs as follows:
      a) Single-Layer Application: 16 inches (406 mm) o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a) Install two studs at each jamb, unless otherwise indicated.
      b) Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
      c) Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:
   1. Screw to wood framing.
   2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 09 22 16

SECTION 09 30 00 — TILING

PART 1 — 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. Reference also the Finish Plan; Finish Schedule, Legend, and Notes; Interior Elevations; and Millwork Details.

1.2 Description of Work:
- A. Provide all labor, materials, equipment and services required for complete installation of all tiling indicated on Drawings and specified herein.

1.3 References:
- A. ANSI A108 Series/A118 Series - American National Standards for Installation of Ceramic Tile.
- B. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.
- C. TCNA (HB) - Handbook for Ceramic Tile Installation; Tile Council of North America.
- D. ISO 13007 - International Standards Organization; classification for Grout and Adhesives.

1.4 Quality Assurance:
- A. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.
- B. Specify porcelain tile and glass tile manufacturer to product order out of same run with same caliper.
- C. To ensure warranty requirements and compatibility of products; provide all tile grout, setting materials, additives, accessories, and factory-prepared dry-set mortars from the same manufacturer and completion of the work is within the manufacturer's expiration date for products, if any.
- D. Installer Qualifications:
  1. Installer is member of the National Tile Contractors Association.
  2. Installer's supervisor for the Project holds the International Masonry Institute's Foreman Certification.
  3. Installer employs Ceramic Tile Education Foundation Certified Installers.

1.5 Submittals:
- A. Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.
- B. Samples: Submit manufacturer's samples for each type of tile and marble threshold showing full range of colors, texture and pattern available for each type specified. Include samples of grout and accessories involving color selection.

1.6 Delivery, Storage and Handling:
- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

B. Do not use frozen materials unless specifically allowed by manufacturer.
C. Deliver and store materials on site at least 24 hours before work begins.
D. Provide heated and dry storage facilities on site.

1.7 Environmental Requirements:
A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
B. For interior applications:
1. Do not begin installation until building is completely enclosed and maintaining temperature and humidity conditions consistent with "after occupancy" conditions for a minimum of two (2) weeks.
2. Maintain continuous and uniform building temperatures of not less than 10°C (50°F) during installation.
3. Ventilate spaces receiving tile in accordance with material manufacturer's instructions.

PART 2 — PRODUCTS

2.1 Manufacturer: Subject to compliance with requirements, provide products of one of the following manufacturers:
A. Specialty Tile Products, Inc.
B. DalTile Co.
C. American Olean Tile Co.

2.2 Porcelain Ceramic Tile Type 1: Tile type shall be Etiquette Porcelain Ceramic Tile as manufactured by American Olean Tile Co. or prior approved equal.
A. Floor Tile (PCT-1):
1. Color: Taupe ET03, Unpolished.
2. Nominal Facial Dimensions: 12" x 24" as selected by Architect.
3. Nominal Thickness: 3/8".
4. Face: Unpolished.
5. Grout Joint: 1/8".

2.3 Porcelain Ceramic Tile Type 2: Tile type shall be Etiquette Porcelain Ceramic Tile as manufactured by American Olean Tile Co. or prior approved equal.
A. Wall Tile (PCT-2):
1. Color: Taupe ET03, Polished.
2. Nominal Facial Dimensions: 12" x 24" as selected by Architect.
3. Nominal Thickness: 3/8".
4. Face: Unpolished.
5. Grout Joint: 1/8".

2.4 Porcelain Ceramic Tile Type 3: Tile type shall be Etiquette Porcelain Ceramic Tile as manufactured by American Olean Tile Co. or prior approved equal.
A. Wall Tile (PCT-3):
1. Color: White ET01, Polished.
2. Nominal Facial Dimensions: 12" x 24" as selected by Architect.
3. Nominal Thickness: 3/8".
4. Face: Polished.

5. Grout Joint: 1/8".

B. Bullnose (PCB-3): Provide bullnose trim to match characteristics of adjoining flat tile and to comply with the following requirements:
   1. Color: To match PCT-2 or PCT-3.
   2. Size: Nominal 3" x 12".
   3. Shape: Surface bullnose.

2.5 Glass Tile: Shall be "Color Wave Classic Solids" as manufactured by Daltile or prior approved equal.

A. GT-1:
   1. Type: 1" x 1".
   2. Color: To be selected by Architect.
   3. Nominal Dimensions: 11-7/8" x 11-7/8" sheets.
   4. Nominal Thickness: 5/16".
   5. Grout Joint: 1/8".

2.6 Marble Thresholds: Shall be Alabama Ceramic "A" marble or equal with honed finish. Thresholds shall be width, thickness and depths as indicated on the drawings.

2.7 Setting Materials:

A. Cementitious Backer Board:
   1. Floor Tile Underlayment: Shall be DUROCK 5/16" Cement Board as manufactured by United States Gypsum Company or approved equal cementitious backer board for thin-set application of ceramic floor tile.
   2. Wall Tile Backer Board: Shall be DUROCK 1/2" Cement Board as manufactured by United States Gypsum Company or approved equal cementitious backer board for thin-set application of ceramic wall tile.
   3. Joint Reinforcement: DUROCK 2" Interior Tape.
   4. Fasteners: DUROCK 1-1/4" steel screws for attachment to steel framing.

B. Thin-Set Mortar: Dry-set portland cement mortar, ANSI A118.1, factory sanded, equal to L & M Surco Thin-Set Mortar as manufactured by L & M Surco Manufacturing Co.

2.8 Grouting Materials:

A. Floor Grout: Commercial sanded portland cement type, color to be selected by Architect from manufacturer's full color range, including "Designer Colors".

B. Wall Grout: Commercial portland cement wall tile grout, colors to be selected by Architect from manufacturer's full color range, including "Designer Colors".

C. Grout Source: Only commercial quality grout, equal to Laticrete "Permacolor" or "Permacolor 2" and Laticrete "1500 Sanded Grout," is to be used. Grout is to be purchased directly from the approved grout manufacturer or commercial tile and grout distributor. Consumer grade grout products available at retail outlets are not equivalent and shall not be used.

D. Grout Mixing: Strictly follow all of the grout manufacturer's instructions for mixing and installing grout, including:
   1. Mixing "whole bag batches," not partial bags.
   2. Water additive proportions and water type.
   3. Mixing method (including manual, where specified by grout manufacturer).
   4. Mixing consistency.

E. Finished Grout Colors: Grout colors, including dark colors or "Black," shall match the manufacturer's approved sample. It shall be the installing tile subcontractor's responsibility to match the specified grout color(s) in the installation. It shall be the General Contractor's responsibility to protect the grout in tiled areas during the remainder of construction from all forms of damage, including contamination, discoloration, staining and debris. (Tiling contractor shall provide and install the protective covering as per Paragraph 3.3.D of this Section.)

PART 3 — EXECUTION

3.1 Tile Installation Standards:

A. Comply with applicable requirements of the Tile Council of America for tile installed with portland cement mortar.

B. Comply with manufacturer's instructions for mixing and installation of proprietary materials.

C. Any deficiencies in the work are to be submitted in writing to the General Contractor as per Paragraph 2.2.A.

D. Tile contractor, by commencing work, assumes overall responsibility to assure that site conditions and all components and parts shown or required for the installation comply with contract documents and are compatible with each other and with the conditions and expected use. Commencement of work signifies acceptance of substrate and installation conditions.

3.2 Installation, General:

A. Pre-Installation Meeting:

1. Two weeks (minimum) prior to the start of porcelain tile installation or delivery of same to the project site, schedule and conduct a meeting with the following persons: Architect, General Contractor's Project Manager and Job Superintendent, Owner's Representative(s), Porcelain Tile Contractor's Project Manager and Job Superintendent, and any other persons whom the Architect, General Contractor, Owner, or Porcelain Tile Contractor request to attend.
2. Critical installation coordination issues (such as schedule, working points, field cuts, grout joints, code requirements, transitions, drain cut outs, equipment cut outs, edges at door and window openings, etc.) shall be reviewed.
3. "Job standards" for finished product and installation items (such as cuts at drains, grout mixes and colors, sealants, etc.) shall be reviewed.
4. Other coordination and scheduling items shall be discussed as required or requested by participants.

B. Install tile using method indicated in strict compliance with manufacturer's printed instructions. Extend tile work into toe spaces, door reveals, and into closets and similar openings.

C. Strictly comply with all manufacturer's recommended instructions, including maximum recommended times for "no traffic allowed." The General Contractor and Subcontractor are to allow for manufacturers' recommended schedules in the scheduling of the work. At the time materials are ordered, the tiling subcontractor shall provide a written statement to the General Contractor, and a copy to the Architect, of the estimated time frames for the tiling installation of each area and the additional "no traffic allowed" time required for each area. The General Contractor

shall strictly enforce the "no traffic allowed" time frames with other trades and shall protect tiled areas from accidental access by anyone during those times.

D. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, and covers overlap tile.

F. Setting Methods:
   1. Floor Tile (Thin-Set): Reference to TCA Method F113-09, Latex-Portland Cement Mortar.
   2. Wall Base (Thin-Set): Reference to TCA Method W202-09, Dry-Set Mortar or Latex-Portland Cement Mortar.
   3. Marble Thresholds: Install in same type setting bed as field tile.

G. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints where adjoining tiles on floor, base, walls, and trim are same size. Layout tile work and center tile field in both directions in each space or on each wall area as indicated on the Drawings. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown. Utilize joint widths as recommended by tile manufacturer for each tile type, unless specifically noted otherwise.

H. Document compliance with each respective manufacturer's required and recommended installation methods and processes as required for proof of same in the event of a potential warranty claim. Provide a copy to the Architect of all documentation.

3.3 Cleaning Protection:

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

B. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but not sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning. Flush surfaces with clean water before and after cleaning.

C. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.

D. Protection: When recommended by tile manufacturer, tiling contractor shall apply a protective coat of neutral protective cleaner to completed tile floors. Tiling contractor shall provide and install Kraft paper or other heavy covering over installed tile work for protection during construction period to prevent damage and wear. All protection materials shall be heavy, breathable paper and shall allow for moisture to escape from the protected tile areas. It shall be the General Contractor's responsibility to protect the tiled areas and rooms with tile work during the construction period from damage and wear. The General Contractor shall ensure that all protective coverings remain intact and as the tiling contractor installed them until the General Contractor advises the tiling contractor that the protective coverings are to be removed for final inspection.

E. Before final inspection, tiling contractor shall remove protective coverings and rinse neutral cleaner from tiled surfaces.

F. All repair or "punch list" work is to be performed by the installing tile subcontractor.

END OF SECTION 09 30 00

SECTION 09 51 00 — ACOUSTICAL CEILINGS

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of all acoustical ceilings and related items indicated on Drawings and specified herein.

1.3 Quality Assurance:

A. Fire Performance Characteristics: Provide acoustical ceiling components that are identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of applicable testing and inspecting agency.

1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
   a) Flame Spread: 25 or less.
   b) Smoke Developed: 50 or less.
2. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" or "FM Approval Guide", for floor, roof or beam assemblies in which acoustical ceilings function as a fire protective membrane; tested per ASTM E 119. Provide protection materials for lighting fixtures and air ducts to comply with requirements indicated for rated assembly.

B. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any).

1.4 Submittals:

A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.

B. Samples:

1. Acoustical Panels: Set of 6" x 4" square samples for each acoustical unit required, showing full range of exposed color and texture to be expected in completed work.
2. Suspension System: Set of 12" long samples of each exposed runner and molding.

1.5 Delivery, Storage and Handling:

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
B. Before installation acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.6 Project Conditions:
A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is complete, and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.7 Maintenance Stock: At time of completing installation, deliver stock of maintenance material to Owner. Furnish full size units matching units installed, packaged with protective covering for storage, and identified with appropriate labels. Furnish amount equal to 2% of acoustical units installed.

PART 2 — PRODUCTS

2.1 Metal Suspension Systems:
A. General:
1. Standard for Metal Suspension Systems: Provide metal suspension systems of type, structural classification and finish indicated which comply with applicable ASTM C 635 requirements.
2. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.
3. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, prestretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C 635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gauge.
4. Edge Moldings and Trim: Metal of types and profiles indicated or, if not indicated, provide manufacturer's standard molding for edges and penetrations of ceiling which fits with type of edge detail and suspension system indicated.
5. Available Manufacturers: Subject to compliance with requirements, provide Armstrong, hot-dipped galvanized in the sizes and styles compatible with specified acoustical panels with a 30-year HumiGuard Plus warranty or approved equal.
6. Available manufacturers: Subject to compliance with requirements, manufacturers offering suspension systems which may be incorporated in the work include, but are not limited to, the following:
a) Donn Corporation
b) National Rolling Mills, Inc.
c) Roper Eastern
d) CertainTeed
7. Type of Suspension Systems: Direct-Hung.
B. Non-Fire-Rated Single Web Steel Suspension System:
1. Structural Classification: Intermediate-Duty System.

2. Finish: Painted, white.

2.2 Acoustical Panels:

A. General:

1. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated which are prepared for mounting method designated and which comply with ASTM E 1264 requirements, including those indicated by reference to type, form, pattern, grade (ASTM C 423 for NRC), light reflectance coefficient (LR), edge detail, and joint detail (if any).
2. Sound Transmission Performance: Provide acoustical ceiling units with ratings for ceiling attenuation class (CAC) of range indicated as determined according to ASTM E 1414 with ceilings continuous at partitions and supported by a metal suspension system of type appropriate for ceiling unit of configuration indicated (concealed for tile, exposed for panels).

B. Type 1 Acoustical Panels: Shall be 2' x 2' x 3/4" nondirectional, lightly textured, nodulated panel with no holes or fissures which meets ASTM E 84, Class A Flame Spread, Type III, Form 1, NRC range shall be .60 - .70, STC range shall be 35 - 39, light reflectance classification shall be LR1. Provide CertainTeed "Cashmere" CM-450, Narrow Reveal Edge, White with 9/16" Celogrid 800 Grid, White.

C. Type 2 Acoustical Panels: Shall be 2' x 2' x 3/4" nondirectional wet formed mineral fiber acoustical panels which meet ASTM E 1264, Class A, Type III, Form 2 for standard washable finish (CVA), NRC shall be .70, CAC shall be 40 and shall have .85 light reflectance. Provide the following or a prior approved equal:

1. Armstrong World Industries, Inc., 1717 Fine-Fissured, Angled Tegular Edge, with 15/16" grid, 30-year Humi-Guard Plus warranty.

D. Substitutions must be approved by the Architect prior to the Bid. Burden of proof for equality of products rests solely with the Contractor.

PART 3 — EXECUTION

3.1 Preparation:

A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Unless otherwise noted, avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.2 Installation:

A. General: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire-resistance rating requirement as indicated, and industry standards applicable to work.

B. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not less than 6" from each end and spaced 4'-0" along each carrying channel or direct-hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12'-0".

C. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.

D. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, countersplaying or other equally effective means.
E. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units. Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.
F. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
G. Provide two (2) wire hangers located diagonally at each lay-in light fixture indicated on the Drawings.

3.3 Adjust and Clean:
A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
B. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 00

SECTION 09 65 19 — RESILIENT TILE FLOORING AND BASE

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all resilient tile flooring and accessories indicated on Drawings and specified herein.
- B. Reference in particular the Floor Plan and Room Finish Schedule.

1.3 Submittals:
- A. Submit current samples of resilient tile flooring and base to the Architect for approval and color selection. All colors will be selected from manufacturer's standard colors.
- B. Submit 36" x 36" mock-up sample of solid vinyl tile pattern selected for Architect's approval prior to ordering product.

1.4 Project Conditions:
- A. Maintain minimum temperature of 65 degrees F. (18 degrees C.) in spaces to receive resilient tile flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient tile flooring 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.
- B. Install resilient tile flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient tile flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by resilient tile flooring manufacturer's recommended bond and moisture test.

1.5 Maintenance Stock: At time of completing installation, deliver stock of maintenance material to Owner. Furnish full size tile matching tile installed, packaged with protective covering for storage, and identified with appropriate labels. Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

PART 2 — PRODUCTS

2.1 Vinyl Composition Tile (VCT):
- A. Shall be first line quality vinyl-composition tile as manufactured by Armstrong, Congoleum, Azrock, or prior approved equal, and shall be equal to Armstrong, Excelon "Imperial Series."
  1. Color: Maximum of three (3) colors will be selected by Architect.

B. All composition tile shall be uniform in thickness and size, cut accurately with square true edges. All tile shall be 12" x 12" x 1/8".

2.2 Solid Vinyl Tile (SVT):
A. Shall be first line quality solid vinyl tile as manufactured by Tandus-Centiva, by Tarkett or prior approved equal.
1. Centiva, Contour Wood Series; Size: 6" x 36" planks; Square Edge: Tick Surface; Color: Maximum of two (2) colors will be selected by Architect. Verify with Architect before ordering.
B. All solid vinyl tile shall be uniform thickness and size, cut accurately with square true edges. All tile shall be 1/8" gauge, in sizes and shapes indicated herein, and shall be a 0.30 mil wear layer of clear rigid PVC.

2.3 Resilient Base:
A. Shall be set-on type equal to "Flex-Cove Set-On Type" Rubber Cove Base as manufactured by Flexco, Inc. Products may be selected from Johnsonite or VPI as well as Flexco. A maximum of six (6) colors will be selected by the Architect.
B. Material shall be 1/8" gauge, 4" high and furnished in continuous rolls. Thinner gauge of resilient base will not be accepted.
C. Furnish necessary end stops, inside and outside corners where applicable.

2.4 Accessories:
A. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.
B. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
C. Leveling and Patching Compounds: Latex types as recommended by flooring manufacturer.
D. Provide resilient reducer strip as manufactured by Flexco or prior approved equal.
1. VCT to concrete reducer.
a) Flexco Reducers.
(1) Color: Architect to select color.
(2) Height: 1/8".
(3) Profile: 192A.

PART 3 — EXECUTION

3.1 Inspection:
A. Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.
B. Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.
C. Do not allow resilient tile flooring work to proceed until subfloor surfaces are satisfactory.

3.2 Preparation:
A. Prepare subfloor surfaces as follows:

1. Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.
2. Remove coatings from subfloor surfaces that would prevent adhesive bond, including curing compounds incompatible with resilient tile flooring adhesives, paint, oils, waxes and sealers.

B. Broom clean or vacuum surfaces to be covered, and inspect subfloor.
C. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.3 Installation, General:
A. Where movable partitions are shown, install resilient tile flooring before partitions are erected.
B. Install resilient tile flooring using method indicated in strict compliance with manufacturer's printed instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.
C. Scribe, cut, and fit resilient tile flooring and base to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.
D. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marking on subfloor. Use chalk or other non-permanent marking device.
E. Install resilient tile flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.
F. Tightly cement resilient tile flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient tile flooring at perimeter of each covered area to assure adhesion.

3.4 Installation of Tile Floors:
A. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room area is of equal width, unless noted otherwise. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.
B. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.
C. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.
D. Install solid vinyl tile floors in patterns as indicated on the Room Finish Schedule and as required in this Specification.

3.5 Cleaning and Protection:
A. Perform following operations immediately upon completion of resilient flooring:
1. Sweep or vacuum floor thoroughly.
2. Do not wash floor until time period recommended by resilient tile flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.
3. Damp-mop floor being careful to remove black marks and excessive soil.

4. Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient tile flooring manufacturers.

B. Protect flooring against damage during construction period to comply with resilient tile flooring manufacturer's directions.

C. Protect resilient tile flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishings across floors.

D. Clean resilient tile flooring not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Clean resilient flooring by method recommended by resilient tile flooring manufacturer.

E. Apply protective floor polish to resilient tile flooring surfaces free from soil, excess adhesive or surface blemishes. Use commercially available metal cross-linked acrylic product acceptable to resilient flooring manufacturer.

F. Apply protective sealer and finisher to SVT resilient flooring surfaces free from soil, excess adhesive, or surface blemishes. Use commercially available S.C. Johnson products: "Taski, R50 Neutral Cleaner," "Professional Over and Under Sealer," and "Taski, Wiwax Finisher" as recommended by flooring manufacturer.

END OF SECTION 09 65 19

SECTION 09 68 00 — CARPETING

PART 1 — 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. Specifically reference the Floor Plans, Finish Plans, Room Finish Schedules, and Finish Schedule Notes.

1.2 Description of Work: Provide all labor, materials, equipment and services required for complete installation of all carpet and accessories indicated on Drawings and specified herein.

1.3 Submittals:

A. Submit:
   1. Samples of each carpet specified to the Architect for color selection and/or verification and specification certification.
   2. Samples shall have a permanently affixed label on the back with Carpet Type #, Manufacturer's Name, Pattern Name / #, Color Name / #, Tile Size, and manufacturer approved installation methods (Quarter Turn, Ashlar, etc.)

B. Submit samples of each type carpet accessory, edge guard, etc. to the Architect for approval and color selection. Samples shall be labeled similar to A.2 above.

C. Submit schedule of door numbers and threshold type required at each location. (Only doors requiring thresholds must be listed.)

D. Submit floor plans of each space scheduled to receive carpet, indicating carpet seaming plans, location and type of transition strips, working points, etc.

E. Maintenance Data:
   1. Each carpet specified shall be included in maintenance manual specified in Division 1.
   2. Provide Architect's copy of warranty claim documentation as per Paragraph 3.1.G of this Section.

1.4 Quality Assurance:

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing carpeting products similar to those required for this Project, on projects of similar scale and complexity, and with a record of successful in-service performance.

B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.5 Delivery and Storage:

A. General: Comply with instructions and recommendations of manufacturer and as herein specified.

B. All carpet materials must be ordered within two (2) weeks of issuance of final Color Finish Schedule by Architect. Orders for material issued on the schedule are not to

be postponed pending resolution of any single carpet selection not included or in question.

C. Do not store rolled goods in upright position. Maintain temperature in storage area above 40 degrees F.

1.6 Job Conditions:

A. Maintain constant minimum temperature of 60 degrees F. at areas of installation for at least 24 hours before and 48 hours after application of materials.

B. Illuminate areas of installation using building's permanent lighting system; temporary lighting alone will not be acceptable.

C. The work is to be bid assuming the substrates and surface preparation are within the required tolerances. If the substrates are found to not be within those tolerances, it shall be the subcontractor's responsibility to submit in writing a list of the deficiencies to the General Contractor. It shall be the General Contractor's responsibility to correct the deficiencies and provide substrates and surfaces preparation compliant with the required tolerances and other criteria of this section.

D. Carpet contractor, by commencing work, assumes overall responsibility to assure that site conditions and all components and parts shown or required for the installation comply with contract documents and are compatible with each other and with the conditions and expected use. Commencement of work signifies acceptance of substrate and installation conditions.

1.7 Maintenance Stock: At the time as directed by the Owner, deliver stock of maintenance material to Owner. Furnish full size carpet tile matching carpet tile installed, packaged with protective covering for storage, and identified with appropriate labels. Furnish not less than one box for each 20 boxes or fraction thereof, for each type, color, pattern and size of carpet tile installed. Deliver to Owner remaining opened and unopened boxes of carpet tile after installation is completed.

PART 2 — PRODUCTS

2.1 Walk-Off Mat: Shall be manufactured by J + J Industries.

A. Style: Runway Modular.

B. Dye Method: Solution dyed.

C. Surface Texture: Textured loop.

D. Gauge: 1/8" (3.15 rows/cm).

E. Pattern Repeat: 24" x 24".

F. Face Yarn: 100% Encore® SD nylon with recycled content.

G. Secondary Backing: Nexus® modular.

H. Special Treatment: ProTex® fluorochemical.

I. Size: 24" x 24" (61.0 cm x 61.0 cm).

J. Color: To be selected by Architect.

2.2 Carpet Types (C-2, C-3, and C-4): Contractor is to allow Thirty Dollars ($30.00) per square yard for carpet material only. This allowance does not include installation materials or accessories, floor prep, labor, freight, sales taxes, or Contractor's overhead and profit. The Architect will select a carpet tile and installation method (Quarter Turn, Ashlar, Monolithic, etc.) and submit the manufacturer's product information on a Finish Schedule Legend to be submitted to the Contractor. If the actual cost of the carpet

selected varies from this Allowance, an adjustment shall be made in the Contract Price accordingly.

2.3 Carpet Accessories:

A. Resilient Carpet Transition: Shall be #168 Resilient Carpet transition strip manufactured by Flexco Company or approved equal. Color as selected by Architect from manufacturer's standard colors. Install at Architect approved locations only.

B. Installation Adhesives: Water-resistant type as recommended by carpet or cushion manufacturer, and which complies with flammability requirements for installed carpet.

PART 3 — EXECUTION

3.1 Installation:

A. Pre-Installation Meeting:

1. Two weeks (minimum) prior to the start of carpeting installation or delivery of same to the project site, schedule and conduct a meeting with the following persons: Architect, General Contractor's Project Manager and Job Superintendent, Owner's Representative(s), Carpeting Contractor's Project Manager and Job Superintendent, and any other persons whom the Architect, General Contractor, Owner, or Carpeting Contractor request to attend.
2. Critical installation coordination issues (such as working points, tile installation method(s), pattern matches, code requirements, clearances, shop drawing notes, transitions strips, etc.) shall be reviewed.
3. "Job standards" for finished product and installation items (such as field cuts, pattern matches, glue removal, etc.) shall be reviewed.
4. Other coordination and scheduling items shall be discussed as required or requested by participants.

B. Clean surfaces to be carpeted; scrape up cementitious and resinous deposits; vacuum; apply sealer on concrete surfaces, adequate to prevent dusting.

C. Pre-plan installation for uniform direction of pattern and lay of pile, and proper sequencing with other work. Locate seams properly, centered under doors and without seams in direction of traffic doorways and similar traffic patterns. Extend carpet under removable obstructions and into closets and alcoves. Verify working points with Architect.

D. Provide a glue-down installation by trimming and fitting carpet widths into each space prior to application of adhesive. Apply adhesive, butter cut edges with seaming cement, butt edges tightly together, and roll lightly, unless otherwise instructed by carpet manufacturer.

E. Install edge guards at exposed edges. Submit type and location to Architect for approval and finish / color selection.

F. Document compliance with each respective manufacturer's required and recommended installation methods and processes as required for proof of same in the event of a potential warranty claim. Provide a copy to the Architect of all documentation.

3.2 Cleaning and Protection:

A. Clean adhesive and cement from face of carpet promptly; replace carpet that cannot be cleaned.

B. Save carpet scraps, defined as carpet tiles larger than a half tile, and deliver to Owner's storage space as directed. Dispose of smaller pieces.
C. Vacuum completed carpet installation with beater-in-nozzle type commercial vacuum cleaner.
D. Protect installed carpet as recommended by carpet manufacturer.
E. Remove and replace work that cannot be successfully cleaned with vacuuming or hot water extraction (no additives) only and repaired to permanently eliminate evidence of damage.
F. All cleaning, repair, or "punch list" work is to be performed by the carpeting subcontractor.

END OF SECTION 09 68 00

SECTION 09 91 00 — PAINTING

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all painting required on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Joint sealers are included under other sections of the specifications.
- C. Work Not Included: Unless otherwise indicated, shop priming of ferrous metal items and fabricated components are included under their respective trades. Pre-finished items, such as acoustic material and the like, are not included. Unless otherwise indicated, painting not required on surfaces on concealed areas except for piping, equipment and other such items within the concealed spaces. Finished metals such as anodized aluminum, stainless steel, bronze, and similar parts of metals will not be painted. Do not paint any moving parts of operating units, or over any equipment identifications, performance rating, name or nomenclature plates or code required labels.

1.3 Submittals:
- A. Verify prior to preparation of color schedule that Architect has an up-to-date color deck of the approved paint manufacturer.
- B. Submit to Architect for approval three (3) samples of each different item to be stained.

1.4 Manufacturer: Provide products by one of the following or an approved equal:
- A. Pittsburgh
- B. Benjamin Moore
- C. Glidden/ICI
- D. Martin-Senour
- E. Sherwin-Williams

1.5 Delivery and Storage: Deliver materials to job site in new, original, and unopened containers bearing manufacturer's name, trade name, and label analysis. Store all paint materials and equipment in an assigned area. Protect floor and wall surfaces against damage. Take necessary precaution to keep fire hazard to a minimum. Leave surface of storage space clean and in condition required for that space.

1.6 Job Conditions:
- A. Maintain constant minimum temperature of 60 degrees F at areas of installation for at least 72 hours before and 48 hours after application of materials.
- B. Illuminate areas of installation using building's permanent lighting system; temporary lighting alone will not be acceptable.

PART 2 — PRODUCTS

2.1 Exterior Paint Systems:

A. Ferrous Metals:
1. 1st Coat (Primer): S-W Galvite HS, B50WZ30.
2. 2nd Coat: S-W SWP Gloss House & Trim, A2 Series.
3. 3rd Coat: S-W SWP Gloss House & Trim, A2 Series.

B. Galvanized Metals:
1. 1st Coat (Primer): None Required. Solvent clean with VM&P Naphtha, 97-726.
2. 2nd Coat: S-W SWP Gloss House & Trim, A2 Series.
3. 3rd Coat: S-W SWP Gloss House & Trim, A2 Series.

C. Woodwork and Trim:
1. 1st Coat (Primer): S-W A-100 Exterior Latex Wood Primer, B42W41.
2. 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series.
3. 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series.

D. Parking Lot Stripping:
1. 1st Coat: S-W Setfast Acrylic Water Borne Traffic Marking Paint.
2. 2nd Coat: S-W Setfast Acrylic Water Borne Traffic Marking Paint.
3. Color: White (International Blue at Handicap Spaces).

2.2 Interior Paint Systems:

A. Woodwork and Trim (Painted):
1. 1st Coat (Primer): S-W PrepRite Classic Primer, B28W101.
2. 2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series.
3. 3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series.

B. Ferrous Metals:
1. 1st Coat (Primer):
2. 2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series.
3. 3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series.

C. Galvanized Metals:
1. 1st Coat (Primer):
2. 2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series.
3. 3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss Enamel, B31 Series.

D. Gypsum Board (Where noted Flat Latex):
1. 1st Coat (Primer): S-W PrepRite Classic Latex Primer, B28W101.
2. 2nd Coat: S-W ProMar 200 Latex Flat Wall Paint, B30W200.
3. 3rd Coat: S-W ProMar 200 Latex Flat Wall Paint, B30W200.

E. Gypsum Board (Where noted Enamel):
1. 1st Coat (Primer): S-W PrepRite 200 Latex Primer, B28W200.
2. 2nd Coat: S-W ProMar 200 Latex Eg-Shel, B20W200 Series.
3. 3rd Coat: S-W ProMar 200 Latex Eg-Shel, B20W200 Series.

2.3 Interior Paint Systems, General:

A. Approximately ten (10) interior paint colors total will be selected.
B. Individual colors may be used on more than one interior surface material.
C. Color selections will be made from the manufacturer's full product line, including deep tone tint bases.
D. Stained finishes to match Architect's sample. Provide three (3) approved finish samples of each type of wood to be stained prior to commencement of work. Note

that different wood species are used for different items; adjust stain formulas as required to provide a uniform color and intensity on all stained items.

PART 3 — EXECUTION

3.1 Painting, General:

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of durable paint film.

3.2 Surface Preparation:

A. General:

1. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in place and not to be finish-painted or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
3. Clean surfaces to be painted before applying paint surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

B. Wood:

1. Clean wood surfaces to be painted of dirt, oil or other foreign substances with scrapers, mineral spirits and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.
2. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
3. When transparent finish is required, use spar varnish for backpriming.
4. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.

C. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

D. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent.

3.3 Application:

A. General:
   1. Apply paint in accordance with manufacturer's directions. Allow a minimum of four (4) hours between coats. Use applicator and techniques best suited for substrate and type of material best applied.
   2. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
   3. Paint surfaces behind movable equipment and furniture same as similar exposed equipment. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
   4. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
   5. Paint backsides of access panels, and removable or hinged covers to match exposed surfaces.
   6. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.
   7. Sand lightly between each succeeding enamel or varnish coat.
   8. Omit first coat (primer) on metal surfaces that have been shop-primed and touch-up painted, unless otherwise indicated.
   9. Paint exterior face only of Fire Extinguisher Cabinets (FEC) to match adjacent wall. Submit 8-1/2" x 11" color sample for Architect's approval where adjacent wall finish is wallcovering or other non-painted finish.
   10. Paint interior surfaces of gypsum board soffits, light boxes, and similar surfaces where fully or partially visible through light lenses, grilles or other materials. Color to be selected by Architect.

B. Scheduling Painting:
   1. Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
   2. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

D. Prime Coats:
   1. Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.
   2. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

F. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.
G. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.4 Clean-Up and Protection:
A. Clean-Up:
1. During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each workday.
2. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
B. Protection:
1. Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting as acceptable to Architect.
2. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
3. At the completion of work of other trades, touch up and restore all damaged or defaced painted surfaces.

END OF SECTION 09 91 00

SECTION 10 14 00 — SIGNAGE

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of signage indicated on Drawings and specified herein.

1.3 Submittals:

A. Samples: Submit samples of each color and finish of exposed materials and accessories required for signage. Architect's review of samples will be for color and texture only.

B. Shop Drawings: Submit shop drawings showing fabrication and erection of signage. Include plans, elevations, and large-scale details of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
2. For signage supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
3. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
4. Rubbings: Furnish full-size rubbings for metal plaques.

1.4 Quality Assurance:

A. Signage Fabricator Qualifications: Firm experienced in producing signage similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signage from one source of a single manufacturer.

C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signage and are based on the specific types and models indicated. Sign units by other manufacturers may be considered provided deviations in dimensions and profiles do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.5 Project Conditions:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.6 Coordination:

A. For signage supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signage.
   1. For signage supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 — PRODUCTS

2.1 Door Signage: Contractor is to allow the sum of $600.00 in the Base Bid for the purchase of Door Signage as specified herein. This allowance does not include sales taxes, Contractor's profit and overhead, or installation cost. The installation shall include approximately five (5) signs. A schedule of door signage requirements will be submitted to the Contractor by the Architect prior to preparation of shop drawings.
   A. Laminated, Etched Photopolymer: Raised graphics with Braille 1/32 inch (0.8 mm) above surface with contrasting colors as selected by Architect from manufacturer's full range and laminated to acrylic back.
   B. Edge Condition: Square cut.
   C. Corner Condition: Square.
   D. Mounting: Framed.
      1. Wall mounted with concealed anchors.
   E. Color: As selected by Architect from manufacturer's full range.
   F. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.

2.2 Handicapped Parking Signage (Two (2) Req'd): 12" x 18" physically handicapped parking signage equal to Series 218-2 as manufactured by the Charleston Industries, Inc., One Industrial Park, P.O. Box 370, Charleston, MS 38921, Tel (800)647-2384, Fax (601)647-3604, or prior approved equal. Signage shall include symbol of access and lettering silk-screened on .125" aluminum blank and mounted on manufacturer's standard painted aluminum 2" square post with post cap. There shall be an additional signage mounted below the symbol of accessibility on one (1) of the signs where indicated on the Drawings which reads "VAN ACCESSIBLE".

PART 3 — EXECUTION

3.1 Examination:
   A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   B. Verify that items, provided under other sections of Work are sized and located to accommodate signage.
   C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
   D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation:

A. General: Locate signage units and accessories where indicated, using mounting methods of type described and in compliance with the manufacturer's instructions.
   1. Install signage level, plumb, and at the height indicated, with signage surfaces free from distortion or other defects in appearance.
   2. Interior Wall Signage: Install signage on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Panel Signage: Attach panel signage to wall surfaces using the methods indicated below:
   1. Vinyl-Tape Mounting: Mount signs 5'-0" above finished floor on door or wall, as indicated on signage schedule to be provided by Architect, unless otherwise indicated using double-sided vinyl foam tape equal to 3M 4416 foam tape. Do not use this method for vinyl-covered or rough surfaces.
   2. Where panel signage are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.

C. Handicapped Parking Signage: Install signage in locations indicated on Drawings with top of sign 72" above finish grade and post set in 6" diameter x 18" deep concrete.

3.3 Cleaning and Protection: After installation, clean soiled signage surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10 14 00

SECTION 10 28 13 — TOILET ACCESSORIES

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all toilet accessories indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Section 08 81 00 – Glass Glazing for frameless mirrors.

1.3 Submittals:
- A. Product Data: For each type of product indicated. Include the following:
  1. Construction details and dimensions.
  2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  3. Material and finish descriptions.
  4. Features that will be included for Project.
  5. Manufacturer's warranty.
- B. Maintenance Data: For toilet accessories to include in maintenance manuals.

1.4 Quality Assurance:
- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.
- 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.

1.5 Coordination:
- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 Warranty:
- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 — PRODUCTS

2.1 Manufacturer: Provide toilet accessories as manufactured by Bradley, Bobrick, ASI or approved equal. Bradley specification numbers are used for reference only.

2.2 Public-Use Washroom Accessories:

A. Grab Bars: Bradley Model 812-001-36" long (3 Req'd), Model 812-001-18" long (3 Req'd) and Bradley Model 812-001-42" long (3 Req'd) grab bars fabricated of type 304 satin finish stainless steel with concealed mounting flanges. Furnish 899-010 mounting kit for toilet partition walls, 899-011 mounting kit for drywall/metal stud partitions with wood blocking and 899-016 mounting kit for concrete block walls.

B. Paper Towel Dispensers / Waste Receptacle (3 Req'd): Bradley Model 2252 recessed towel dispenser / waste receptacle. Cabinet, flange, and towel dispenser are fabricated of 22 gauge stainless steel with satin finish and seamless construction. Flange is 1" wide with a 1/4" return. Doors are 18 gauge stainless steel, warp resistant with full length piano hinge and tumbler lock.

C. Toilet Tissue Holders:

1. Surface Mounted Toilet Tissue Dispenser with Shelf (3 Req'd): Bradley Model 5263 surface mounted toilet tissue dispenser fabricated of 18 gauge stainless steel with satin finish two standard core toilet tissue rolls. Shelf fabricated of 18 gauge stainless steel with satin finish. Radius on all corners. Overall dimensions: 16" w x 3-15/16" h x 6" d.

D. Framed Mirrors (3 Req'd): RestroomDirect.com Model ASI-10-0600, 30" w x 36" h x 5/8" d, standard mirror with stainless steel Inter-lok frame with welded corners polished to smooth finish.

2.3 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.

PART 3 — EXECUTION

3.1 Installation:

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 Adjusting and Cleaning:

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturers written recommendations.

END OF SECTION 10 28 13

SECTION 10 44 00 — FIRE PROTECTION SPECIALTIES

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all fire protection specialties and accessories indicated on Drawings and specified herein.
- B. Field painting of fire protection specialties shall be as specified in Section 09 91 00 - Painting.

1.3 Quality Assurance:
- A. Provide portable fire protection specialties and accessories by one manufacturer, unless otherwise acceptable to Architect.
- B. UL-Listed Products: Provide new portable fire extinguishers that are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.4 Submittals:
- A. Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include rough-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selection by Architect is required, include color charts showing full range of manufacturer's standard colors and designs available.

PART 2 — PRODUCTS

2.1 Fire Extinguishers and Cabinets:
- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  1. J.L. Industries.
  2. Larsen's Mfg. Co.
  3. Muckle Manufacturing, Division.
  4. Profile International, Inc.

  Larsen specification numbers given for reference to standard only for fire extinguishers and cabinets.
- B. Fire Extinguishers (4 Req'd): Shall be Larsen MP10 or approved equal 10 lb. multi-purpose dry chemical fire extinguisher capable of extinguishing Class A, B and C fires.

C. Cabinets (3 Req'd): Shall be Larsen 2409-6R or approved equal constructed of cold-rolled steel with a standard finish of white baked acrylic enamel, 25" x 10-1/2" x 4" r.o. Door shall be solid panel with black horizontal letters.
D. Wall Brackets (1 Req'd): Shall be Larsen B-2 extinguisher bracket constructed of heavy gauge steel with a white baked enamel finish.

2.2 Fire Department Key Box: Provide Knox-Box 3200 Series recessed mounted High Security Commercial Key Box with hinged door and UL Listed tamper switches as manufactured by Knox Company, 1601 W. Deer Valley Road, Phoenix, AZ 85027, Tel: (800) 552-5669, Fax: (623) 687-2299, Web: www.knoxbox.com.
A. Construction: Key box shall be constructed of 1/4" plate steel housing, 1/2" thick steel door with interior gasket seal. Box and lock shall be UL Listed. Lock shall have 1/8" dust cover with tamper seal mounting capability.
B. Exterior Dimensions: Recessed mounting, 7" h. x 7" w. x 3-1/4" d.
C. Lock: UL Listed, double-action rotating tumblers and hardened steel pins accessed by a biased cut key.
D. Finish:
1. Pre-Treatment: Zinc-phosphate to Federal Standard TTC 490 Type II.
2. Final Coating: Weather resistant interior and exterior TGIC polyester powder coat.
3. Finish Color: Dark Bronze.
E. Recessed Mounting Kit: Knox-Box 3200 Series Recessed Mounting Kit (RMK). Kit shall be furnished with shell housing and mounting hardware to be cast-in-place in new concrete or in masonry construction.
1. Dimensions: 6-1/8" h. x 6" w. x 5" d., including rebar.
2. Mounting Height: 6'-0" a.f.f. to bottom of RMK shell.

PART 3 — EXECUTION

3.1 Examination:
A. Examine walls and partitions for suitable framing depth and blocking where recessed fire protection specialties will be installed.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation:
A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
B. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
C. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
D. Where exact location of surface-mounted cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

3.3 Identification: Identify fire extinguisher in cabinet with black horizontal lettering spelling "FIRE EXTINGUISHER" on a decal applied to door following field painting of cabinet. Provide lettering on door as indicated, or if not indicated, as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.

3.4 Adjusting and Cleaning:

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Touch up marred finishes, or replace fire protection specialties that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection specialties manufacturer.

C. Replace fire protection specialties that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 00

SECTION 11 15 00 — BANKING EQUIPMENT

PART 1 — 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. Certain items of bank equipment construction and furnishings indicated on the Drawings will be furnished and installed under this Contract by STS Group, Madison, Alabama, for the allowance amount(s) included in Part 2 - Products of this Specification.

B. The type of banking equipment to be furnished and installed include the following:

1. Modular Vault
2. Night Depository
3. Access Control
4. Alarm
5. Lockout System
6. Digital Video System
7. SD Box Move
8. Three-Person Teller Pod

C. Related Work Specified Elsewhere: Section 03 30 00 – Cast-In-Place Concrete, Section 06 41 16 – Plastic-Laminate-Clad Architectural Cabinetry, and Division 26 - Electrical.

PART 2 — PRODUCTS

2.1 Banking Equipment Allowance (Base Bid): Provide a Lump Sum Allowance of $96,000.00 for the purchase and installation of Banking Equipment by Owner selected vendor listed in this Specification and indicated on the Drawings. The sum allowed for Banking Equipment includes taxes and installation by the Subcontractor. The General Contractor shall allow and provide all profit and overhead costs in addition to the Allowance figure included herein.

PART 3 — EXECUTION

3.1 Coordination:

A. Coordinate installation of banking equipment Certified Alarm to comply with Drawings and final shop drawings in strict compliance with manufacturer's printed instructions.

END OF SECTION 11 15 00

SECTION 11 31 00 — KITCHEN EQUIPMENT

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of kitchen equipment indicated on Drawings and specified herein. See Floor Plans and Interior Elevations for locations.
- B. Types of kitchen equipment required include the following:
  1. Cooktop
  2. Refrigerators
  3. Wall Oven
  4. Microwave Ovens
  5. Dishwasher
- C. Related Sections include the following:
  1. Division 6 Section "Wood Veneer Faced Architectural Cabinetry" for custom-made cabinets and plastic laminate and/or solid surface tops that receive kitchen equipment.
  2. Division 22 Section for plumbing services to kitchen equipment.
  3. Division 26 Section for electrical services to kitchen equipment.

1.3 Submittals:
- A. Product Data: For each type of product indicated. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.
- B. Maintenance Data: For each product to include in maintenance manuals.

1.4 Quality Assurance:
- A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for product's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- C. Regulatory Requirements: Comply with provisions of the following product certifications:
  1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
3. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.
4. NAECA: Provide residential appliances that comply with NAECA standards.

D. Energy Ratings: Provide kitchen equipment that carries labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.

E. All appliances shall be Energy STAR rated.

1.5 Delivery and Storage: Deliver products to project site in manufacturer's undamaged protective containers, after spaces to receive them have been fully enclosed.

PART 2 — PRODUCTS

2.1 Manufacturers: The design for each residential appliance is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified:

1. Amana Refrigeration Inc.
2. Frigidaire; White Consolidated Ind.
3. General Electric
4. Hotpoint
5. KitchenAid
6. Peerless-Premier
7. Sears, Roebuck & Co.
8. Thermador
9. Modern Maid; Raytheon Co.
10. Whirlpool Home Appliances
11. White-Westinghouse

2.2 Cooking Appliances:

A. Slide-In Front Control Electric Range (Break Room 123). G.E. Model # JS630DFBB, 30" Slide-In Range, or prior approved equal. Finish color shall be Black.

B. Microwave Oven (Break Room 123): G.E. Model #JEM3072DHBB 0.7 Cu. Ft. Capacity Countertop Microwave Oven, or prior approved equal. Finish color shall be Black.

C. Under The Cabinet Hood (Break Room 123): G.E. Model # JVX3300DJBB, 30" Under The Cabinet Hood or prior approved equal. Finish color shall be Black.

2.3 Refrigeration Appliances:

A. Refrigerator (Break Room 123): G.E. Model #G1E21GTHBB, 21.2 cu. ft. Top Freezer Refrigerator or prior approved equal. Finish color shall be Black.

2.4 Cleaning Appliances:

A. Dishwasher (Break Room 123): G.E. Model #GDF510PGJBB, American Gray Plastic Tub Interior Built-In Dishwasher or prior approved equal. Finish color shall be Black.

2.5 Finishes, General:

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 — EXECUTION

3.1 Examination:
- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation, General:
- A. General: Comply with manufacturer's written instructions.
- B. Built-In Equipment: Securely anchor units to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Utilities: Refer to Division 22 for plumbing requirements and Division 26 for electrical requirements.
- E. Follow Up: All follow up work, including any items cited on the Final Inspection, is to be performed by the original subcontractor who installed the appliances.

3.3 Cleaning and Protection:
- A. Test each item of kitchen equipment to verify proper operation. Make necessary adjustments.
- B. Verify that accessory items required have been furnished and installed.
- C. Remove packing material from kitchen equipment items and leave units in clean condition, ready for operation.

3.4 Demonstration:
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain kitchen equipment.

END OF SECTION 11 31 00

SECTION 11 33 00 — RETRACTABLE STAIRS

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of retractable stairs indicated on Drawings and specified herein.

1.3 Delivery, Storage and Handling:
- A. Examine stairway upon delivery to jobsite. Notify carrier and manufacturer of any damage.
- B. Store stairway until installation under roof, if possible. If stored outside, cover with tarp or suitable cover.

PART 2 — PRODUCTS

2.1 Manufacturer: Precision Ladders, LLC, 2279, Morristown, Tennessee 37816-2279, Phone (800)225-7814, Fax (423)586-2091.

2.2 Materials:
- A. Door:
  1. 20 gauge steel door with 2 hour fire-rated Warnoc Hersey label that meets ASTM E-119 and UBC 43-7 requirements, passed 250˚ temperature rise in the first 30 minutes.
  2. Steel piano hinge.
  3. Fire-rated steel door flush with bottom of frame.
  4. Eye bolt accommodates pole for opening and closing.
- B. Stairway:
  1. Stringers:
     a) 6063-T6 Extruded aluminum channel 5" x 1" x 1/8".
     b) Tri-fold design.
     c) Steel blade type hinges.
     d) Adjustable foot with plastic Mar-guard.
     e) Pitch 63˚ (standard). Other pitches optional.
  2. Treads:
     a) 6063-T6 Extruded aluminum channel 5-3/16" x 1-1/4" x 1/8".
     b) Depth: 5-3/16".
     c) Width: 21-1/4" (standard). Lengths to 30" available.
     d) Deeply serrated top surface.
     e) 9-1/2" riser height (standard). Other riser heights available.
     f) 500 lbs. Load rating.
- C. Frame:

1. Custom fabricated from 1/8" steel with factory-installed tread(s) to cover the distance from finished ceiling to finished floor above. Frame shall be on a 63 degree angle on the hinge end in order to continue the climb from ceiling and beyond on the same incline as the folding portion of the unit. The frame shall have pre-drilled and mounted brackets to allow for hanging from and fastening to the floor above.

D. Hardware:
   1. Steel blade type hinge connection stringer sections, zinc-plated and chromate-sealed, bolted to stringers.
   2. Steel operating arms, zinc-plated and chromate-sealed.
   3. Double acting steel springs and spring cables, both sides.
   4. Rivets rated at 1,100 lb. shear.

E. Safety:
   1. Steel bar handrail riveted to stringers, upper section, right side standard. Other locations optional.
   2. Steel section alignment clips at stringer section joints.
   3. Molded rubber guards at corners of aluminum door panel.

F. Manufactured Units: The retractable stairway shall be Model S1144-A-30. Floor to floor height is approximately 10'-1"; field verify.

G. Accessories:
   1. Steel pole to aid opening and closing stairways. The pole is equipped with a hook on one end to engage the eyebolt in door panel.
   2. Optional keyed lock for door.

H. Fabrication: The stairway shall be completely fabricated ready for installation before shipment to the site.

I. Finishes:
   1. Mill finish on aluminum stairway components.
   2. Prime coat on frame.

J. Source Quality Control:
   1. All products tested in factory test jig for proper operation.

PART 3 — EXECUTION

3.1 Examination: Examine rough opening in ceiling for opening size and squareness.

3.2 Installation: Install per the manufacturer's installation instructions.

END OF SECTION 11 33 00

SECTION 12 36 61 — QUARTZ COUNTERTOPS

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all quartz countertops indicated on Drawings and specified herein.
- B. Summary: Extent of interior quartz work is indicated on Drawings, particularly Schedules, Details and Interior Elevations.
- C. Related Sections include the following;
  1. Division 6 section Rough Carpentry for blocking.
  2. Division 7 Section Joint Sealers.

1.3 Submittals:
- A. Product Data:
  1. Quartz Surfacing; Submit manufacturer’s product data.
  2. Quartz Surfacing; Submit manufacturer’s care and maintenance data.
- B. Samples:
  1. Submit two 4" x 4" quartz samples of specified product.
- C. Adhesive:
  1. Submit actual samples (printed color charts are not acceptable) of manufacturer's joint adhesive for Architect's selection.
  2. Submit two samples of joint adhesive selected by Architect for each quartz material specified.
- D. Shop Drawings: Submit Shop Drawings after all field measurements have been taken. If not possible, submit revised Shop Drawings after field measurements are taken and prior to the ordering of material. Submit cutting and setting drawings of entire scope of quartz work, indicating sizes, dimensions, sections and profiles for quartz units, arrangement and provisions for jointing, supporting, anchoring and bonding quartz work; and other details showing relationships with, attachment to, and reception of, related work. All joints are to be clearly indicated on Shop Drawings.
- E. Fabricator Qualifications:
  1. Work of this section shall be performed by an approved fabricator/installer by the manufacturer.

1.4 Quality Assurance:
- A. Single Source Responsibility for Quartz: Obtain each color, grade, finish, type and variety of quartz from a single source with resources to provide materials of consistent quality in appearance and physical properties, including the capacity to cut and finish material without delaying the progress of the Work.
- B. Single Source Responsibility for Setting Materials: Obtain mortar ingredients of uniform quality and from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

C. Installer Qualifications: Engage an Installer who has successfully completed quartz work similar in material, design and extent to that indicated for this project.

1.5 Delivery, Storage and Handling:
A. Deliver materials to project in undamaged condition.
B. Store and handle quartz and related materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping, or other causes.
1. Do not use pinch or wrecking bars.
2. Lift with wide-belt type slings where possible; do not use wire rope or ropes containing tar or other substances which might cause staining. If required for moving quartz, use wood rollers with cushions at end of wood slides.
3. Store quartz on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and quartz to distribute weight evenly and to prevent breakage or cracking of quartz.
4. Protect quartz on wood skids or pallets, covered with non-staining, waterproof membrane, but allow air to circulate around quartz.
5. Store cementitious materials off the ground, under cover and in dry location.

1.6 Project Conditions: Do not set quartz when air temperature or temperature of materials is below 50 deg. F.

1.7 Warranty:
A. Closeout Submittals:
1. Provide manufacturer’s completed warranty form.

PART 2 – PRODUCTS:

2.1 Manufacturers:
A. Acceptable Manufacturers:
1. MS International
2. Caesarstone
3. HON Stone

2.2 Materials:
A. Material:
1. Homogeneous mixture containing 93% pure quartz with additions of high performance polyester resin, pigments and special effects. Cambria is licensed to utilize Bretonstone™ technology and equipment used to compact and polish mixture, and is the only producer of quartz surfaces in the United States.
B. Color: Maximum of three (3) colors will be selected by Architect.
C. Thickness: 1-1/4" (3mm) and 3/4" (2mm) as indicated on Architectural Drawings.
D. Identification:
1. Material shall be labeled with manufacturer’s identifying mark.
E. Exposed Edges and Corners: Square edge profile with eased edges.
F. Performance:
1. Water Absorption: 0.02%; ASTM C97-09
2. Specific Gravity: 148.3 lbs/ft3; ASTM C97-09

3. Modulus of Rupture: 9,300 psi; ASTM C99-09
4. Compressive Strength: Dry - 23,700 psi, Wet - 22,100 psi; ASTM C170-14
5. Flexural Strength: 8700 psi; ASTM C880-09
6. Abrasion Resistance: 31.9 lw; ASTM C1353-15
7. Weather Resistance: No Damage
8. Density: 2.38 g/cm3; ASTM C373
9. Bond Strength: 237 ppsi; ASTM C482
10. Thermal Shock: No Damage Passed 25 cycles; ASTM C484
11. Wear Resistance: 139 lw; ASTM C501
12. Thermal Expansion: 2.61 x 10-5 in/in F C531
13. Breaking Strength: 480 lbs; ASTM C648
14. Chemical Resistance: No Damage; ASTM C650
15. De-icing Resistance: No Damage; ASTM C672
16. Static Coefficient of Friction: Dry - 0.78, Wet - 0.61; ASTM C1028
17. Izod Impact: 0.363 ft. lbs/in; ASTM D256
18. Chemical Reagents Resistance: No Damage; ASTM D543
19. Mold Resistance: No Microbial Growth; ASTM D6329
20. Flame Spread: Index - 5, Smoke Development Index 75; ASTM E84
21. MOS: HOH's Hardness; 6.5

2.3 Accessories:

A. Mounting Adhesive:
   1. Provide structural grade '50-year' 100% silicone or epoxy adhesive.
   2. Acceptable silicone manufactures: As recommended by quartz manufacturer.
   3. Acceptable epoxy manufactures:
      a) Cambria Two Part Acrylic Adhesive.
      b) Integra Adhesives
      c) Akemi North America.
      d) Bonstone Material Corporation.
      e) Tenax USA.

B. Quartz Surface Adhesive:
   1. Provide epoxy or polyester adhesive of a type recommended by manufacturer for application and conditions of use.
   2. Acceptable manufacturers:
      a) Cambria Two Part Acrylic Adhesive.
      b) Akemi North America.
      c) Bonstone Material Corporation.
      d) Tenax USA.
   3. Adhesive which will be visible in finished work shall be tinted to match quartz surface in color approved by Architect.

C. Provide fasteners, grout, hardware, and other accessories as required for a complete installation.

D. Joint Sealant:
   1. Clear sealant of type recommended by manufacturer for application and use.
   2. Acceptable manufacturers:
      a) Dow Corning.
      b) GE Sealants.

E. Solvent: Denatured alcohol for cleaning quartz surfacing to assure adhesion of adhesives and sealants.

F. Cleaning Agents: Mild soap and water.

2.4 Fabrication:

A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that may impair structural integrity, function, or appearance.
   1. Repairs that are characteristic of the varieties specified are acceptable provided they do not impair structural integrity or function and are not aesthetically unpleasing, as judged by Architect.

B. Grade and mark stone for final locations to produce assembled countertop units with an overall uniform appearance.

C. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated.
   1. Clean sawed backs of stones to remove rust stains and iron particles.
   2. Dress joints straight and at right angle to face unless otherwise indicated.
   3. Cut and drill holes in stone for anchors, supports, and attachments.
   4. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
   5. Fabricate molded edges with machines having abrasive shaping wheels made to reverse contour of edge profile to produce uniform shape throughout entire length of edge and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units. Form corners of molded edges as indicated with outside corners slightly eased unless otherwise indicated.
   6. Finish exposed faces of stone to comply with requirements indicated for finish of each stone type required and to match approved Samples and mockups. Provide matching finish on exposed edges of countertops, splashes, and cutouts.

D. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

E. Layout:
   1. Layout surface to minimize joints and avoid L-shaped pieces of quartz surfacing. Layout and fabricate with ‘hairline’ joints.

F. Inspection of Materials:
   1. Inspect materials for defects prior to fabrication.

G. Tools: Cut and polish with water cooled powered tools.

PART 3 — EXECUTION

3.1 Pre-Installation Examination:

A. Site Verification:
   1. Verify dimensions by field measurements prior to installation.
   2. Verify that substrates supporting quartz surfaces are plumb, level and flat to within 1/8 inch in 10 feet and that all necessary supports and blocking are in place.

B. Inspection of Quartz Surfaces:
   1. Inspect materials for imperfections prior to installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation:

A. Prepare Surface:
   1. Clean surfaces prior to installation.

B. Protection of Quartz Surfaces:
   1. Protect finished surfaces from scratches. Apply masking where necessary. Take necessary precautions to prevent dirt grit dust and debris from other trades from contacting the surface by covering the top and exposed edge profiles after installation is completed.

3.3 Installation:
A. Install materials in accordance with manufacturer's instructions and approved shop drawings.
B. Preliminary Installation:
   1. Position materials to verify the correct size.
   2. If size adjustments, or additional fabrication is necessary, use water cooled tools. Protect jobsite and surface from dust and water. Perform work away from installation site if possible.
   3. Allow gaps for expansion of not less than 1/8 inch(1.5mm) per ten feet when installed between walls or other fixed structure.
C. Permanent Installation:
   1. After verification of fit and finish, clean substrate; remove loose and foreign matter which may interfere with adhesion. Clean quartz surface backside & joints with denatured alcohol.
   2. Horizontal surface: Apply continuous bead of 100% silicone at the intersection point of the Cambria countertop and the substrate or cabinet. This bead will be continuous throughout the entire perimeter. Color to match quartz and be approved by Architect.
   3. Vertical surface: Apply continuous bead of mounting adhesive around Perimeter. In addition, apply 1/4 inch mounting adhesive bead every 8 inches on vertical center.
   4. Fasteners, grout and hardware. Install as required.
   5. Install quartz surfacing plumb, level, square and all on the same plane.
   6. Align adjacent pieces in same plane.
D. Joints:
   1. Joints Between Adjacent Pieces of Quartz Surfacing:
      a) Joints shall be flush, minimally sized, tight fitting, level and neat.
      b) Securely join adjacent pieces with Cambria Two Part Acrylic Adhesive.
      c) Fill joints level to polished surface.
      d) Secure adjacent quartz surfaces with vacuum clamps until adhesive hardens.
   2. Joints Between Quartz Surface and Substrates:
      a) Seal joints with 50-year 100% silicone sealant

3.2 Repair:
A. Perform finish work or replace damaged material in a satisfactory manner.

3.3 Cleaning:
A. Remove masking, excessive adhesive and sealants. Clean exposed surfaces with denatured alcohol.

3.4 Protection:
A. Protect installed fabrications with non-staining sheet coverings.

END OF SECTION 12 36 61

SECTION 13 34 23 — PREFABRICATED CUPOLA

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of prefabricated cupola indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Section 05 12 10 – Structural and Miscellaneous Steel, Section 06 10 00 – Rough Carpentry, Section 07 31 13 – Asphalt Shingles, and Section 07 92 00 - Joint Sealants.
- C. Lightning protection grounding is specified in Division 26 - Electrical.

1.3 Submittals:
- A. Shop Drawings: The cupola manufacturer shall submit shop drawings for the fabrication of prefabricated cupola indicating all details, profiles, dimensions and materials.
- B. Samples: Cupola manufacturer shall submit 6" square sample of exterior covering material from which the cupola will be fabricated.

1.4 Quality Assurance:
- A. Manufacturer: Company specializing in fabrication of cupola or steeple structures with ten (10) years minimum experience.
- B. Fabrication and installation shall be by manufacturer.
- C. Design Criteria: The cupola as submitted shall be structurally designed to withstand a wind force as required by local building codes.
- D. The cupola contractor shall comply with the following specifications:
  1. Suggested Specifications of Structures of Aluminum Alloys 6061-T6 and 6062-T6 as recorded in the Journal of the Structural Divisions, Proceedings of the American Society of Civil Engineers.
  2. American Institute of Steel Construction.

1.5 Job Conditions:
- A. Substrate: Proceed with work only after substrate construction and penetrating work have been completed.
- B. Weather Conditions: Proceed with work only when substrate is completely dry.

1.6 Delivery, Storage and Handling:
- A. Upon receipt of cupola and other materials, installer shall examine the shipment for damage and completeness.
- B. Stack all materials to prevent damage and to allow for adequate ventilation.

1.7 Protection of Existing Structures, Utilities and Vegetation:

A. Existing structures, utilities or new work shall be protected, to the extent possible, by the cupola contractor during installation operations.
B. Any damage done except to underground utilities not known by the cupola contractor will be repaired completely by same at no cost to the owner.

PART 2 — PRODUCTS

2.1 Manufacturer: Cupolas shall be as produced by Campbellsville Industries, Inc., P.O. Box 278, Campbellsville, KY 42718, (800)467-8135, Fax (502) 465-6839, Website: http://cvilleindustries.com, E-mail: steeple@cvilleindustries.com, or prior approved equal 10 days prior to bid date by Architect.

2.2 Materials: Cupola materials shall be free from defects impairing strength, durability and appearance, shall be of best commercial quality for purpose required, and shall be obtained from a source that is regularly engaged in the manufacture of such products.

A. Exterior Covering: Fluropon finish shall be applied on aluminum by the roll coat method and shall be oven baked. This finish shall be of such quality that any shearing or forming encountered during fabrication will not separate the finish from the aluminum. Streaks and holidays will not be permitted. The aluminum shall be minimum .032 gage, alloy 3003-H14. All horizontal and vertical seams shall be lock formed.
B. Cupola Cornices: Shall be formed true to dimensions as shown on the approved drawings. Vertical joining shall be kept to a minimum.
C. Tower Framing: Shall be fabricated from aluminum alloy 6061-T6 or structural steel. The aluminum framing shall be fastened together with rivets with welding limited to secondary architectural members. Steel framing shall be welded, bolted, or riveted in accordance with current steel fabricating practices.
    1. Aluminum surfaces in contact with steel at the base of the steeple shall be given one coat of zinc primer. The steel surface shall be painted with a primer such as red lead or zinc chromate, followed by one coat of aluminum paint. The steel preparation shall be performed by the General Contractor.
    2. Anchoring bolts, nuts, and washers shall be cadmium plated.
    3. Aluminum rivets shall be from alloy 6061-T6 and shall be cold driven to fill the holes completely.
    4. Aluminum rivets shall not be loaded in tension.
D. Caulking Compounds: Shall be suitable for external use and shall have good adhesive qualities.
    1. All surfaces shall be clean and dry when compound is applied. Compound shall be applied with a gun using nozzle of proper size to fit the joint width, and shall be forced into grooves with sufficient pressure to fill the groove solidly.
    2. Silicon construction sealant by Dow Corning or equal shall be used.
E. Polyurethane Insulation: Cupola manufacturer shall apply a coat of polyurethane insulation to the interior of the secondary architectural bonding exterior cladding to structure ranging from 1/2" to 1-1/2" in thickness.
F. Lightning Protection: Cupola manufacturer shall provide U.L. approved grounding cable from top of the cupola to extend a minimum of 5'-0" below the base of the cupola. Grounding material consisting of a U.L. approved 24 strand woven 14 gauge aluminum wire. Connection from the base of the cupola to the ground shall be accomplished by the electrical subcontractor.

2.3 Fabrication:
- A. Fabricate structural steel framing to conform to AWS standards.
- B. Fabricate structural aluminum framing with cold driven aluminum rivets, limiting welding to secondary architectural members.
- C. Form all exterior cladding with good and acceptable sheet metal practices, and lock form all seams inasmuch as possible.
- D. Conceal all exterior fasteners to maximum possibility.
- E. Use cadmium plated bolts, nuts, and washers for anchoring, unless anchoring materials are provided and installed by others.

PART 3 — EXECUTION

3.1 Installation:
- A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck metal roofing and other substrates to receive prefabricated cupola as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
- B. The General Contractor shall provide a crane, crane operator, and an approved OSHA man basket for cupola manufacturer to unload and hoist the cupola into position for as long as may be required by the manufacturer.
- C. Isolation: Where metal surfaces of units are to be installed in contact with incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.

3.2 Cleaning and Protection:
- A. Clean exposed metal surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.
- B. Installer shall advise Contractor of required procedures for surveillance and protection of prefabricated cupola so that it will be without damage or deterioration, other than normal weathering, at time of substantial completion.

END OF SECTION 13 34 23

SECTION 22 05 00 — PLUMBING GENERAL PROVISIONS

PART 1 — 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: Provide all materials, labor, management, equipment, fixtures, start-up, fabrication, services, cleaning, testing and balancing required for complete installation of all plumbing provisions indicated on Drawings, Schedules and specified in this section.

A. This Contractor shall review all of the Contract Documents including all Drawings and Specifications of all Trades to ensure the complete implementation of Work.

B. Where shown or noted on the Drawings or where called for in other Sections of the Contract Documents, the Contractor for this Division shall install equipment furnished by Others, and shall make required service connections. Contractor shall verify with the supplier of the equipment the requirements for the installation.

C. Where the words "provide", "furnish", "include", or "install" are used in the Specification or on the Drawings, shall mean to furnish, install, and test complete and ready for operation, the items mentioned.

D. Drawings for the Work are diagrammatic to express the scope of the Work and to indicate the general arrangement and locations of the Work. Due to Drawings constraints, certain items such as pipe fittings, offsets, access panels, devices and sleeves may not be shown. This Contractor shall be responsible for confirming that the fixtures, piping and equipment fit the space provided. The location and sizes for pipe, fittings, sleeves, access panels and other basic items required by Code and other sections shall be coordinated and included for the proper installation of the work.

E. Specifications may not deal with diminutive installation requirements, parts, controls, and devices required which may be required to produce the equipment performance specified or as required to meet the equipment warranties and applicable Code. Such items shall be included, whether or not specifically called for in the Contract Documents.

F. Coordinate with all Trades in submittal of shop drawings. Shop drawings shall be prepared to clearly indicate all applicable components. Space conditions shall be detailed to the satisfaction of all trades, subject to review and final acceptance by the Engineer. In the event that the Contractor installs work before coordinating with other trades or so as to cause any interference with work of other Trades, the necessary changes shall be made to the work to correct, at no additional cost to the Owner, Architect or Engineer.

1.3 Contractors Qualifications:

A. The qualifications of this Contractor for shall be as follows:

1. Contractor must be a licensed General Contractor, specific to this section's Trade, in the project's State.

2. The Contractor shall have been in the plumbing contracting business for the last five consecutive years, under their current corporation name with more than 75% of the same corporate officers.
3. The Contractor shall have completed at least two projects of comparable size and scope within the past two years without receipt of a Notice to Cure.
4. If Contractor has received a Notice to Cure on any project, that Contractor is excluded from performing work on this project.
5. The Contractor's main construction and service office shall be located within 60 driving miles distance of the project site unless approval, 10 days prior to project bid date, has been issued in writing by the Owner, Architect and Engineer.
6. The Contractor shall provide substantiating proof of these requirements 10 days prior to project bid date. If substantiating proof is not submitted and approved, the Contractor will not be allowed to bid or work the project.
7. The General Contractor shall not purchase this Contractor's equipment, materials, etc. All materials, equipment, labor, etc. required to perform the Work herein shall be at the cost of this Contractor.

1.4 Codes and Standards:

A. Conform to latest edition of governing codes, ordinances, adoptions and or regulations of the authority having jurisdiction. Where local codes are not applicable, conform to the latest International Code Counsel requirements.

1.5 Fees, Permits, and Inspections:

A. Secure all permits and pay all fees required in connection with the Work.
B. Coordinate and provide such inspections as are required by the Authorities having jurisdiction over the site.
C. Where applications are required for procuring of services to the building, prepare and file such application with the authority having jurisdiction. Furnish all information required in connection with the application in the form required by the authority having jurisdiction.

1.6 Site Inspection:

A. Contractor shall inspect the site to become familiar with conditions of the site which will affect this Contractor's work and shall verify points of connection with utilities, routing of Work to include required clearances from any obstacles.
B. Additional payment will not be provided for changes in the Work required because of Contractor's failure of said familiarization and understanding.

1.7 Active Service:

A. Existing active services are to be located and shall be protected against damage. Do not disrupt operation, functionality and cleanliness of active services which are to remain. If active services are encountered which require relocation, make request to authorities having jurisdiction for determination of procedures. Where existing services are to be abandoned, they shall be terminated in compliance with requirements of the authority having jurisdiction.

1.8 Substitutions:

A. Any equipment, material, etc. submitted as "equal" to the basis of design shall be accompanied with a "one – to – one" comparison letter from the vender stating any differences from the equipment being submitted and the basis of design. A letter is

also to be submitted from the vender, on the vender's letterhead, stating that the vender has received a copy of the job all Specifications, Addendums and Drawings.

B. Substitutions for the scheduled and specified equipment shall only be done with the prior approval of the Engineer, and shall be obtained in writing. Prior approvals shall be obtained no less than 10 days prior to the project bid date. Prior approval shall not relieve the contractor of supplying equipment that meets the specifications, capacities, efficiencies, physical dimensions, etc.

1.9 Substitutions and Product Options:

A. Products specified only by reference standard, select product meeting that standard in accordance to the projects funding requirements, i.e. Made in the USA.

B. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with the schedules and specifications. When three are mentioned, the 10 day prior approval is still required.

C. For products specified, noted or scheduled stating "or equivalent", "or equal" or similar wording, submit a request for proposed substitutions for any product or manufacturer which is not specifically named for review and prior approval by the Engineer.

D. For products specified by naming only one product and manufacturer, the Engineer may provide approval of a product of equal or greater quality or performance. Submittal must be received 10 days prior to project bid date accompanied with a one – to – one comparison letter.

1.10 Substitution Submissions:

A. Each substitution submittal request shall be accompanied with:

1. Comprehensive data proving compliance of proposed substitution with requirements stated in the contract documents:
   a) Product identification.
   b) Manufacturer's literature shall identify:
      (1) Manufacturer's name, address, phone number, point of contact and email address.
      (2) Product description.
      (3) Reference standards.
      (4) Performance and test / compliance data.
      (5) Warranty information of all components.
   c) Two projects of similar size and scope on which product has been used, date of each installation and project Owner's recommendation.
   d) Itemized comparison of the proposed substitution with product specified listing any variations.
   e) Changes in construction schedule.
   f) How the substitution will affect other Trades.
   g) List of changes required in any other work, products or required to be made by other Trades.
   h) Availability of repair services, sources of replacement materials, etc.

B. Substitutions will not be considered for acceptance when:

1. Substitution requires substantial revision of contract documents.
2. They are indicated or implied on shop drawings or product data submittals without a formal request from Contractor or Supplier prior to bid.
3. Information is deemed inadequate by the Engineer necessary for complete evaluation.

1.11 Contractor's Substitution Responsibilities:

A. Contractor affirms that:
   1. Contractor has determined that the substitution is equivalent to or superior in all respects to that scheduled and or specified.
   2. Contractor will provide the same warranties, guarantees and or bonds for substitution as for product scheduled and or specified.
   3. Contractor will coordinate installation of accepted substitution into the work, and will make changes as required for the work to be complete in all respects.
   4. Contractor waives claims for additional costs caused by substitution.

B. The Contractor shall have included all costs associated with the substitution for the specified products or materials, and that no additional cost will be incurred by any other party in order to fully incorporate the substituted item(s).

C. The Contractor agrees to reimburse the Architect/Engineer for any architectural or engineering re-design that is required by the substitution to be fully incorporated. The reimbursement shall be at the Architect/Engineer's standard billing rate.

1.12 Engineer's Duties:

A. Notify Contractor in writing of decision to accept or reject requested substitution.

1.13 Submittals:

A. General:
   1. Submit to Engineer shop drawings and product data required by the Drawings and Specifications.
   2. Contractor shall compile all data required to satisfy the Scope of Work implied by the Contract Documents.
   3. Submit a minimum of 6 copies of data, more if required by the Architect. Coordinate with Architect and Engineer to verify if Electronic Submittals, i.e. PDF, may be allowed 10 days prior to bidding the project. If Electronic Submittals are allowed, 2 bound hard copies, as stated below must be submitted as well as the Electronic file.

B. Submittal Requirements:
   1. Review shop drawings and product data prior to submission to Engineer.
   2. Submit only complete project submittals. Partial submittals or submittals not complying with the above requirements shall be returned to the contractor un-marked and rejected.
   3. Engineer's review is only to check for general conformance with the design concept of the project and general compliance with Contract Documents. No responsibility is assumed by the Engineer for correctness of dimensions, details, quantities, procedures, etc. shown on shop drawings or submittals.
   4. In the interest of project expediency the contractor may pre-submit long lead items for pre-approval pending prior approval of the Engineer. However, the Contractor shall not be relieved of including the same data as required by submittal binder and shall be included therein.
   5. If a pre-submittal is made, provide a tab for items not included and include an explanation of why item is not included in the submittal and the expected submittal date.
   6. PDF submittals must be searchable and tabbed per section. All devices, materials, etc. that assemble a fixture, system, etc. shall reside in the same tab.

7. Hard copy submittals shall be compiled in a 3-ring, hard bound, loose leaf binder. The face of the binder shall be clearly marked with the project title and number, the name of the Owner, Architect, Engineer, General Contractor and this Contractor.
8. Provide an index, numerically indicating all sections applicable to the submittal.
9. Separate binders shall be provided for HVAC, Plumbing and Fire Suppression trades.
10. Provide tab dividers for each section submitted.
11. If an item appears on the drawings not specifically covered by the specifications, provide an additional numeric tab at the end of the index detailing the item and include the submittal data in the binder. All devices, materials, etc. that assemble a fixture, system, etc. shall reside in the same tab.
12. All equipment included on the submittal sheets shall be marked to indicate the mark of the equipment as shown on the drawings. The equipment shall be high-lighted to clarify which items are being submitted.
13. When required, the contractor will be provided with an electronic copy of this section's Drawings. Shop drawing submittals shall consist of one digital copy in .dwg format and one in PDF format. The drawing's sheet sizes shall be formatted to the same size as the Contract Documents. A digital copy in PDF format shall be returned to the contractor with the Engineer's approval stamp and comments.
14. Verify field measurements, field construction criteria, catalog numbers, and similar data.
15. Notify Engineer in writing of deviations from requirements of Contract Documents at time submittals are made. A "deviation" shall be construed to mean a minor change to the sequence indicated on drawings or specification. A "deviation" is not intended to allow substitutions or product options.
16. Deviations in submittals from requirements of the Contract Documents are not relieved by Engineer's review of submittals, unless Engineer gives written acceptance of specific deviations.
17. Work may not commence until submittals have been returned with Engineer's stamp and signature indicating approval. Materials and equipment that were installed prior to being approved shall be removed and replaced with approved items at no additional cost to other parties.
18. Shop Drawings and or submittals requiring resubmission to the Engineer due to non-compliance with the Contract Documents and or incompleteness shall be thoroughly reviewed by the Contractor prior to delivery to the Engineer for review. The Contractor shall ensure the completeness and compliance of the submittal materials and shall reimburse the Engineer at the Engineer's standard hourly billing rate for review of submittals beyond the second submission.
19. Omission in shop drawings of any materials indicated in Contract Drawings, mentioned in Specifications, Scheduled or required for proper execution and completion of Work, does not relieve the Contractor from responsibility for providing such materials.

1.14 Openings, Cutting, and Patching:

A. This Contractor shall coordinate required openings in the structure, walls, ceiling, floor roof, etc. with all Trades and applicable Engineers.

B. When additional patching is required due to failure of coordination; provide the patching required to properly close openings including "put back" and painting. Patching must meet the Owner's, Architect's and all applicable Engineer's approval.
C. When cutting and patching of the building is required due to failure to install piping, sleeves, or equipment on schedule or failure to provide the information required for openings, provide the cutting and patching as required. Patching must meet the Owner's, Architect's and Engineer's approval.

1.15 Protection:
A. Equipment and material shall be completely protected from weather elements, painting, plaster, etc. until the project is completed. Damage from rust, paint, scratches, etc. shall be repaired as required to restore equipment to original condition. If repair is deemed unacceptable by the Owner, Architect or Engineer, the equipment, material, device, etc. shall be replaced with new at no additional cost to the Owner, Architect or Engineer.
B. Piping within walls, in particular within studs, shall be protected with 16 gauge metal cover plate, on both sides of stud, equal to Sampson HSS Stud Shoe.
C. Where the installation or connection of equipment requires work in areas previously finished by other Contractors, the area shall be protected and not marred, soiled, or otherwise damaged during the course of such work. Contractor shall arrange with all other Contractors for repairing and refinishing of such areas which may be damaged.
D. When welding is required inside the building, a fire watch shall be provided. The fire watch shall provide adequate protection of existing surfaces and observance of adjacent floors where penetrations exist or are to be made.

1.16 Wiring for Equipment:
A. Division 22 shall provide all motors, controllers and contactors for equipment furnished under this Division, except where they are to be provided under another Division. Coordinate among all Trades prior to bidding project.
B. Electrical work provided under Division 22 shall conform to the requirements of Division 26.
C. Division 26 shall provide power for motors and equipment furnished by this Contractor including safety disconnect switches, starters and final connections. This Contractor is responsible for coordinating with the Electrical Contractor and all other Trades, for wiring that is beyond this Contractor's credentials.
D. Include provisions required for systems controls and integration into building Life Safety and Building Automation Systems.
E. Coordinate with Division 26 for all equipment which requires electrical services. Provide information as to the exact location for rough-in, electrical load, size, and electrical characteristics for all services required.

1.17 Protection of Electrical Equipment:
A. Water piping shall not be installed in electrical rooms, unless it serves the room and meets the AHJ's requirements, or directly above electrical equipment.

1.18 Excavating, Trenching, and Backfilling:
A. Provide excavation necessary for underground piping, etc. Backfill trenches and excavations after work has been installed, tested and approved. Care shall be taken in excavating, that walls and footings and adjacent load bearing soils are not disturbed, except where lines must cross under a wall footing. Where a line must

pass under footing, the crossing shall be made by the smallest possible trench to accommodate the pipe. Excavation shall be kept free form water by pumping if necessary. Any open trench shall be protected with signage, fencing, etc. Trenches shall be excavated in accordance with all regulatory Codes and AHJ requirements.

B. Trenches for piping and utilities located inside foundation walls and five (5) feet outside of the exterior wall shall be not less than sixteen (16) inches or more than twenty-four (24) inches wider than the outside diameter of the pipe to be laid. The widths of trenches for piping and utilities located more than five (5) feet outside of building foundation walls, other than for sewers, shall be governed by conditions found at the site.
C. Pipes must be buried 24" (min.) to the top of the pipe. Grade the trench and provide 6" sand base for the pipe, with the body of the pipe supported. Bottoms of trenches shall be so shaped that when pipe is in place the lower fourth of the circumference for the full length of the pipe will be supported on compacted fill. Bell holes shall be dug so that no part of the weight of the pipe is supported by the bell but shall be no larger than necessary for proper jointing. All piping required for the structure shall be excavated to at least (6) inches below pipe invert.
D. Immediately after testing and/or inspection, the trench shall be carefully backfilled with earth free from clods, brick, etc., to a depth one-half the pipe diameter and then firmly tamped in such a manner as not to disturb the alignment or joints of the pipe. Thereafter, the backfill shall be tamped every vertical foot.

1.19 Concrete Work:

A. Provide concrete bases and housekeeping pads for equipment unless indicated otherwise. Concrete work shall be as specified in the applicable Civil and Structural Sections. Vibration pads, equipment bases, pipe supports and thrust blocks shall be provided by this Contractor.
B. Provide equipment anchor bolts and coordinate their proper installation and accurate location.

1.20 Anchoring of Equipment:

A. All equipment located on floor slab that is capable of being moved shall be secured to the floor with anchor bolts. A minimum of two bolts are required per each piece of equipment and bolts shall be of sufficiently size to prevent equipment from overturning.
B. Roof mounted equipment and curb shall be secured to the roof structure in compliance to ICC wind loading provisions.

1.21 Access Panels:

A. Access Panel shall be of appropriate size to allow for full service and removal of device behind the access panel.
B. Provide access panels where required and not shown on the drawings for installation by the drywall or masonry Contractor. Access panels shall be steel, primed ready for paint. All access panel locations shall be approved by the Architect/Engineer.
C. Provide fire rated access panels in rated walls, ceilings and floors. Rates shall be in compliance to the assemblies rating. This Contractor shall review Life Safety Drawings for required locations of fire rated access panels.

1.22 Sleeves:

A. Sleeves passing through non-load bearing or non-fire rated walls and partitions shall be Schedule 40 PVC pipe or cast iron pipe.
B. Sleeves passing under or through load bearing walls, concrete beams, foundations, footings, and waterproof floors shall be Schedule 40 galvanized steel pipe. Sleeve diameter shall be a minimum of 2 pipe sizes larger than pipe being protected.
C. Sleeves for insulated piping shall be of sufficient internal diameter to take pipe and insulation and to allow for free movement of pipe. Sleeve diameter shall be a minimum of 2 pipe sizes larger than pipe being protected. Waterproof sleeves shall be of sufficient internal diameter to take pipe and waterproofing material.
D. In finished areas where pipes are exposed, sleeves shall be terminated flush with wall, partitions, and ceilings, and shall extend 1/2" above finished floors. Extend sleeves 1" above finished floors in areas likely to entrap water.

1.23 Escutcheons:
A. Provide chrome plated escutcheons at each sleeved opening into finished and exposed exterior spaces. Escutcheons shall fit around insulation or around pipe when not insulated; outside diameter shall cover sleeve. Where sleeve extends above finished floor, escutcheon shall clear sleeve extension. Secure escutcheons to sleeve with set screws or other approved devices.

1.24 Insulation Protection:
A. Where exposed insulated piping extends to floor, provide aluminum wrap guard around insulation. Aluminum wrap and straps shall be trimmed to eliminate sharp cutting edges.

1.25 Connections for Fixtures and Equipment Under Another Section or By Owner:
A. Rough all equipment requiring connection to systems provided under this Division. Verify requirements and current locations before proceeding with work.
B. Make all connections to equipment furnished under another Section or by the Owner as required to obtain complete and working systems.

1.26 Test and Demonstrations:
A. Systems shall be tested and placed in proper working order prior to demonstrating systems to Owner.
B. Prior to acceptance of the installation, demonstrate to the Owner representative all features and functions of all systems installed, and instruct the Owner in the proper operation and maintenance of such systems. The Contractor shall allow for five working days and all required tools, devices, etc. to perform the demonstrations / instructions.
C. Provide necessary trained personnel to perform the demonstrations and instructions. Provide manufacturer's representatives for systems as required to assist with the demonstrations.
D. Dates and times for performing the demonstrations shall be coordinated with the Owner.
E. Upon completion of demonstrations, provide a certificate testifying that demonstrations have been completed. Certificate shall list each system demonstrated, dates demonstrations were performed, names of parties in attendance, and shall be signed by the Contractor and Owner.

1.27 Observations of Work:

A. The Contractor shall schedule an observation, performed by the Engineer and AHJ, one week in advance of the observation, prior to any Work being concealed, covered, etc.

B. If the Contractor schedules an observation and the Work is found not ready or not per the Contract Documents by the Engineer, the Contractor shall reimburse the Engineer, at the Engineer's standard hourly rate, including travel time, for a follow up observation.

C. A copy of the AHJ's report for any work observed or inspected by the AHJ shall be submitted to the Architect and Engineer.

1.28 Operating and Maintenance Manuals:

A. General:

1. Provide three "As Built" copies of shop drawings, product data, and other information described in this Section for use in compiling operating and maintenance manuals.
2. Provide legible submittals made by permanent reproduction copy equipment from typewritten or typeset originals.
3. Pre-punch 8-1/2 inch x 11 inch sheets in three ring, hardback, binders.
4. Submit larger sheets in rolled, protected packages.
5. Submit all in a PDF format as well as the hard copy sets mentioned above.

B. Compilation:

1. The Contractor will compile shop drawings, brochures, materials lists, technical data, warranties, guarantees, and other pertinent information and will assemble, catalog, and file information in loose-leaf, hardback three-ring binders.
2. Submittal Format: Provide each of the following items, as applicable, for each required item or system. Refer to specific Specification section requirements.
   a) Item: Use appropriate Section title.
   b) System Description: Provide a detailed description of each system, describing function, components, capacities, controls and other data specified, and including the following:
      (1) Quantity.
      (2) Sizes.
      (3) Operation.
      (4) Detailed operating instructions, including start-up and shut-down of each system, with indications for position of all controls, as applicable.
      (5) Wiring Diagrams: Complete wiring diagrams for internally wired components including controls.
      (6) Operating Sequence: Describe in detail.
      (7) Manufacturers Data: Provide catalog data sheets, specifications, nameplate data and parts list.
      (8) Preventative Maintenance: Provide manufacturer's detailed maintenance recommendations.
      (9) Troubleshooting: Provide manufacturer's sequence for trouble-shooting procedures for operational problems.
      (10) Extra Parts: Provide a listing of extra stock parts furnished as part of the Contract.
      (11) Warranties: Provide specific manufacturer's warranty. List each component and control covered, with day and date warranty begins,

date of expiration and name, address and telephone number of person to contact regarding problems during warranty period.

(12) Directory: Provide names, addresses, emails and telephone numbers of Contractor, its subcontractors, suppliers, installers and authorized service and parts suppliers.

1.29 Record Drawings:

A. The Contractor shall record the exact locations, as installed, all equipment, pipes, and vents whether concealed or exposed which were not installed exactly as shown on the contract drawings.

B. Upon completion of the work, this data shall be recorded to scale, by a competent CAD operator in .dwg format of no more than two versions past current. Electronic drawings in .dwg format will be furnished to the Contractor by the Architect/Engineer. Where the work was installed exactly as shown on the contract drawings the .dwg file shall not be disturbed other than being marked "As-Built". In showing the changes, the same legend shall be used to identify piping, etc., as was used on the contract drawings. Separate electronic drawings shall be prepared for plumbing, heating, air conditioning, and ventilating work unless two or more divisions are shown on the same sheets of the contract drawings, in which case the various subcontractors shall also show their changes on the same sheets. Each sheet shall bear the date and name of the Contractor submitting the drawings.

C. The Contractor shall review the completed As-Built drawings and ascertain that all data furnished on the .dwg files is accurate and truly represent the work as actually installed. Where plumbing, hot or chilled water pipes, inverts etc., are involved as part of the work, the Contractor shall furnish true elevations and locations, all properly referenced by using the original bench mark used for the institution or for this project.

D. The Contractor shall not distribute the Drawings without the expressed written consent of the Engineer. The Engineer shall authorize the Contractor to produce and distribute the As-Built drawings as follows:

1. One (1) to the Engineer.
2. One (1) to the Architect.
3. One (1) to the Owner.

1.30 System Guarantee:

A. Work required under this Division shall include a one-year guarantee. Guarantee by Contractor to Owner to replace for Owner any defective workmanship or material which has been furnished under contract at no cost to the Owner, Architect or Engineer for a period of one year from date of Substantial Completion. Guarantee shall also include all reasonable adjustments of system required for proper operation during guarantee period. Guarantee shall not include normal preventative maintenance services or filters.

B. At "Demonstration", one-year guarantee provision by Contractor shall be explained to Owner.

1.31 Painting and Identification:

A. Touch-up paint where equipment has sustained "minor" damage shall be applied with factory provided paint and finish, to match original finish. Damaged shall only be deemed "minor" by the Engineer's assessment.

B. Provide engraved, laminated plastic tags for all equipment. Tags shall be attached with permanent adhesive or pop-rivet(s).

1.32 Finishing:

A. Prior to acceptance of the installation and final payment of the Contract, the Contractor shall perform the work outlined in the Contract Documents.

B. At the conclusion of the construction, all portions of the project work shall be cleaned thoroughly of all debris and unused materials remaining from construction.

C. Equipment and piping systems shall be cleaned internally. The Contractor shall open all dirt legs and remove strainers / filters, completely blowing down as required and clean strainer screens of all accumulated debris. Finished strainers, sized by the manufacturer shall be installed in place of startup strainers, filters, etc.

D. All tanks, fixtures, and pumps shall be drained and proven free of sludge and accumulated matter.

E. All temporary labels, stickers, etc., shall be removed from all fixtures and equipment. (Do not remove permanent name plates, equipment model numbers, ratings, etc.). Painting over equipment nameplates will not be allowed. Nameplates will be replaced with new if damaged or painted over. All equipment shall have affixed adjacent to the permanent nameplate, the unit identification on an engraved label with permanent adhesive or pop-rivet(s).

F. Plumbing fixtures, equipment, tanks, pumps, etc., shall be thoroughly cleaned externally as well.

PART 2 — PRODUCTS

NOT APPLICABLE

PART 3 — EXECUTION

NOT APPLICABLE

END OF SECTION 22 05 00

SECTION 22 05 32 — SUPPORTS AND ANCHORS

PART 1 — 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: Provide all materials, labor, administration and services required for complete installation of all supports and anchors indicated on Drawings and specified within this section.
- A. Vent piping, water and waste piping, vent piping appurtenances, hangers, supports and required anchors.
- B. Equipment bases, frames and supports.
- C. Flashing and sealing equipment and pipe penetrations.
- D. Sleeves and seals.

1.3 References:
- A. American Society of Mechanical Engineers (ASME)
- B. American Society of Testing and Materials (ASTM)
- C. National Fire Protection Association (NFPA)

1.4 Work Furnished, Installed Under Other Sections:
- A. Furnish hangers and sleeve inserts for placement into formwork, framework, structure, slab, etc.

1.5 Submittals:
- A. Submit shop drawings and product data for all items listed under this section.
- B. Indicate hanger / support framing and attachment methods.
- C. Provide hanger / support framing loading limits, location and load of each hanger / support frame.

1.6 Site Condition:
- A. Do not drill, cut, burn or weld structural members in connection with the installation of pipe supports, bracing and anchorage devices, unless proposed in writing and approved in writing by the Engineer.

PART 2 — PRODUCTS

2.1 Pipe Sleeves:
- A. Sleeves Through Interior Walls, Floors and Ceilings:
  1. Sleeves through Non-Fire Rated floors: Schedule 40 PVC pipe.
  2. Sleeves through Non-Fire Rated walls, footings, and foundation walls: Schedule 40 PVC 2 pipe sizes larger than service pipe.
  3. Sleeves through beams shall be only in locations and of construction approved by the Structural Engineer.

4. Sleeves for floor or wall penetrations at rated assemblies shall conform to Specifications Section 23 05 60.

B. Sleeves Through Exterior Below Grade Walls, Floors and Ceilings:
   1. Schedule 40 Bitumen Coated Steel 2 pipe sizes larger than service pipe.

C. Sleeves Through Exterior Above Grade Walls:
   1. Schedule 40 Bitumen Coated Steel 2 pipe sizes larger than service pipe. Sleeve shall extend 1/8" past finished interior and exterior of wall assembly and painted to match finished wall. Sleeve shall be sealed weather tight.

D. Escutcheons:
   a) Public Areas: Solid plate stainless steel with satin finish.
   b) Non-Public Areas: Split ring chrome plated with set screws.
   c) Size: Minimum one inch annulus shall be provided except at building seismic joints. Building seismic joint pipe sleeves shall be minimum of 5 inches greater than the nominal diameter of the pipe.

2.2 Fabrication:

A. Size pipe sleeves large enough to allow for movement due to expansion and contraction and continuous insulation.

2.3 Flashing:

A. Metal Flashing: paint grip galvanized steel.
B. Lead Flashing: 5 lbs./ft^2 sheet lead for waterproofing.
C. Caps: 20 gauge minimum galvanized steel; minimum 16 gauge at fire resistant elements or as required per assembly rating. Caps shall be paint grip when exposed.

2.4 Pipe Hangers and Supports:

A. Provide pipe hangers, supports and guides hot-dip galvanized unless otherwise indicated. Provide copper-plated hangers on un-insulated copper pipes.
B. Hangers and support components shall be factory fabricated materials designed.
   1. Components shall have hot dipped galvanized coating; electroplate is not acceptable.
   2. Strap type hangers shall not be used on any piping system; use only clevis type. The clevis hanger fastener nuts shall be nylon lock type.
C. Anchors for pipe hanger and supports shall be either of the following types as applicable to installation condition:
   1. Galvanized metal inserts cast into concrete at time of placing.
   2. Anchor bolts for floor mounted equipment may be of a type to be placed in drilled holes and set in place with high strength cement grout.
   3. Wedge type, type 316 stainless steel, expansion bolts, anchor bolts set in drilled holes in accordance with manufacturer's instructions. Use of drop-in anchors are prohibited.

2.5 Types of Hangers:

A. Hangers for Cold Pipe: Carbon steel, adjustable clevis.
B. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable clevis.
C. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll clevis.
D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
E. Vertical Support: Steel riser clamp.
F. Copper Pipe: Carbon steel rings, adjustable, copper plated.

G. Hanger Rods: Mild steel continuous threaded.
H. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms. Size inserts to suit threaded hanger rods.

2.6 Anchors and Anchorage Devices:
A. Anchors and Bolts: Bolts and studs, nuts and washers shall be Type 316 stainless steel.
B. Fasteners and Accessories: Provide anchors and fasteners, washers, straps and accessories required for a complete and finished installation. Fasteners shall be Type 316 stainless steel.
C. Expansion Bolts: Where anchors are not included in the concrete or masonry construction, anchors shall be Type 316 stainless steel screws or bolts with expansion-shield type concrete or masonry anchors, of sizes and types indicated or required.

2.7 Finish:
A. Concealed: Provide rust inhibiting primer coat to all support, hanger, anchor, etc.
B. Exposed: Provide rust inhibiting primer coat and two finish coats, color to be selected during the submittal phase, to all support, hanger, anchor, etc.

PART 3 — EXECUTION

3.1 Pipe Hangers and Supports:
A. Support horizontal piping as follows:

Pipe Size	Maximum Hanger Spacing	Hanger Diameter
1/2" – 1-1/4"	6'-6"	3/8"
1-1/2" – 2"	10'-0"	3/8"
2-1/2" – 3"	10'-0"	1/2"
4" – 6"	10'-0"	5/8"
PVC (all)	6'-0"	3/8"
Cast Iron (all)	5'-0"	5/8"

B. Install hangers to provide minimum 1/2" space between finished covering and adjacent work.
C. Place a hanger within 12" of each elbow.
D. Use hangers with 1-1/2" minimum vertical adjustment.
E. Support horizontal cast iron pipe adjacent to each hub.
F. Support vertical piping at every floor or every 10 feet whichever is more frequent. Support vertical cast iron pipe at each floor at hub.
G. Support riser piping independently of connected horizontal piping.
H. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
I. All hangers, hanger rods, supports, etc. shall be double-nutted.

3.2 Equipment Bases and Supports:
A. Provide equipment bases of concrete type, minimum 6" thick with 4" A.F.F.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
C. Construct support of steel members. Brace and fasten with flanges bolted to structure.
D. Provide rigid anchors for pipes after vibration isolation components are installed in accordance with the vibration isolation manufacturer's requirements.

3.3 Flashing:
A. Flash vent and soil pipes projecting 3" minimum above finished roof surface with lead worked 1" minimum into hub, 8" minimum clear on sides. Turn flanges back into wall and caulk, metal counter flash and seal pipes through outside walls,
B. Flash floor drains with lead 10" clear on sides. Fasten flashing to drain clamp device.

3.4 Sleeves:
A. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.
B. Install escutcheons as described above.

END OF SECTION 22 05 32

SECTION 22 05 53 — PLUMBING IDENTIFICATION

PART 1 — 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: Provide all materials, labor, administration and services required for complete installation of all plumbing identification indicated on Drawings and specified within this section.

A. Identification of domestic cold, hot, recirculating water, deionizer water, industrial water, non-potable water, sanitary drain, sanitary vent, acid waste, acid vent and rain leader piping systems.

1.3 Submittals:

A. Submit samples and manufacturer's installation instructions for all identification products used.

PART 2 — PRODUCTS

2.1 Materials:

A. Pipe Markers:

1. Equal to Seton Snap Around Pipe Markers. Acrylic plastic with UV inhibitors. Markers shall indicate direction of flow. Legends shall be alternately reversed and repeated for viewing from any angle. Markers shall be factory formed for the installed diameter.

B. Valve Markers:

1. Engraved Metal Tack Markers shall be provide and pop riveted to the Tee Bar main for use of identifying valve locations above acoustical tile ceilings. Color to be selected by submittal. Markers shall be numbered with standard 3/16" characters.
2. Valve tags shall be Seton, 2” stamped brass tags with chain. Tag shall indicate floor served and service of respective valve.

PART 3 — EXECUTION

3.1 Piping:

A. Piping shall be identified at maximum 20 feet intervals, at each side of floor / wall penetration, and at each valve. Piping identification shall include type of service, size of pipe and direction of flow.

B. Piping shall be marked by the following schedule:

1. Domestic Cold Water: White letters on Green.
2. Domestic Hot Water: Black letters on Yellow.
3. Hot Water Recirculating: Black letters on Yellow.

4. Non-potable Water: Black letters on Yellow.
5. Industrial Water: Black letters on Yellow.
6. Sprinkler Water: White letters on Red.
7. Natural Gas: Black letters on Yellow.
8. Sanitary Drain: White letters on Green.
9. Sanitary Vent: White letters on Green.
10. Roof Drain: White letters on Green.
11. Compressed Air: White letters on Blue.
12. Acid Waste: Black letters on Orange.
13. Medical air: Black letters on Yellow.
14. Nitrogen: White letters on Black.
15. Nitrous Oxide: White letters on Blue.
16. Oxygen: White letters on Green.
17. Medical / Surgical Vacuum: Black letters on White.

END OF SECTION 22 05 53

SECTION 22 05 60 — THROUGH PENETRATION FIRE STOPPING

PART 1 — 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: Provide all materials, labor, administration and services required for complete installation of all through penetration fire stopping indicated on Drawings and specified within this section.

A. Provide fire stopping for the following through penetrations:
   1. Domestic hot, cold and hot water recirculation water, rain leaders, sanitary waste and vent.
   2. Conduit for wiring and controls.

1.3 References:

A. Underwriters Laboratories (UL).
B. American Society for Testing and Materials (ASTM).

1.4 Contractor Requirements:

A. The contractor shall have at least 5 years experience with through penetration fire stopping systems and shall have completed a least 2 comparable scale projects using these systems.
B. Provide statement from manufacturer that installer has to be trained in the proper method of installing fire stop systems

1.5 Submittals:

A. Product data including the following:
   1. Detailed specification of construction and fabrication installation instructions and technical data.
B. Shop Drawings:
   1. For each standard application of penetration item and surface being penetrated provide a manufacturers UL approved system cut sheet identifying the UL system number, UL classified devices or materials to be used, other materials to be used, anchorages, sleeves, annular space requirements and sizes, dimensions and locations of all items.
   2. For each non-standard application, provide a manufacturer’s qualified engineering judgment and drawing.
   3. All UL approved systems shall be selected based on their rating. All systems shall provide the same ratings as the rating of the penetration, as shown on the plans.
C. Guarantee:
   1. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability or appear to deteriorate in any other manner not clearly

specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

1.6 Storage:
A. Coordinate delivery with scheduled installation date, allow minimum storage at site. Store and protect materials in a manner and environment per the manufacturer's requirements.

1.7 Project Conditions:
A. Contractor shall review and become familiar with all Drawings and / or visit the job site prior to bid, to verify wall and floor types to be penetrated. Fire ratings of walls are indicated on the Architectural Drawings. Ratings of the floors are assumed to be two (2) hours unless otherwise indicated on the Architectural Drawings.
B. Contractor shall coordinate with the other Trades for any penetrating items that have to be routed differently than shown on the plans. Contractor shall provide fire stopping for all rerouted items whether different UL approved systems or additional materials are required.

PART 2 — PRODUCTS

2.1 Through Penetration Fire Stopping:
A. Acceptable manufacturers and products shall be those listed in the UL fire resistance directory for the UL system involved.
B. All systems and devices shall be asbestos free.
C. All fire stopping products shall be from a single manufacturer.

PART 3 — EXECUTION

3.1 General:
A. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
B. Verify that penetrations are properly sized and in suitable condition for application of materials.
C. Prepare surfaces in accordance with the fire stopping manufacturer's requirements.

3.2 Installation:
A. Install penetration seal materials in accordance with printed instructions of the U.L. Fire Resistance Directory and in accordance with manufacturer's instruction.
B. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install fire stopping materials capable of supporting same loading as floor.
C. Place non-intumescent fire stopping in annular space around fire dampers before installation of damper's anchoring flanges, which are installed in accordance with fire damper manufacturers requirements.
D. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray or other items, close unused portions of opening in accordance with the U.L. assembly. See U.L. Fire Resistance Directory.

3.3 Adjusting and Cleaning:
- A. Neatly trim materials as required.
- B. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.4 Field Quality Control:
- A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.

END OF SECTION 22 05 60

SECTION 22 07 10 — INSULATION FOR PLUMBING SYSTEMS

PART 1 — 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: Provide all labor, materials, accessories, equipment, administration and perform all operations required for the correct fabrication and installation of thermal insulation applied to the following piping systems indicated on Drawings and Specifications.

A. Insulation work shall be performed by a competent insulation contractor whose primary business is the installation of insulation systems and who has been in this type of insulating business for a minimum of five years.

B. Work of this section shall include the insulation for the following plumbing systems that may or may not be present on this project:

1. Domestic cold, hot, hot water recirculating water and non-potable water.
2. Hot water piping below grade.
3. Rain Leaders including Emergency Rain Leaders.
4. Traps, trap arms, cold and hot water supplies.
5. Traps on condensate receiving floor / hub drains systems above grade.
6. Heated or chilled equipment.

1.3 Submittals:

A. Submit product literature for each insulation and finish type, for material and or equipment served. Submit installation requirements for each type of insulation used.

B. Product samples shall be provided at the discretion of the Engineer.

1.4 System Performance:

A. Insulation materials furnished shall meet the minimum thickness requirements of ASHRAE 90.1.

PART 2 — PRODUCTS

2.1 Thermal Insulation:

A. All insulating systems shall be tested on a composite basis in accordance with:

1. ASTM E-84
2. NFPA 255
3. UL 723

B. All material shall be finished having a maximum flame spread rating of 25 and a maximum smoke developed rating of 50.

C. Interior Piping:

1. Rigid Fiberglass equal to Owens Corning - Fiberglas ASJ and SSL II adhesive closure system.

2. Closed cell, flexible electrometric thermal insulation, black in color, supplied in unslit tubing, equal to Armaflex AP 2000. Thickness shall be in accordance with ASHRAE 90.1.

D. Interior fittings on 1/2 and 3/4 inch pipes and accessories may use job built mitered fittings of similar material as piping. Valves and fittings 1 inch and up shall use molded preformed fiberglass fittings sized for the fitting or device being insulated. All fittings and devices being insulated shall be covered with a preformed, white, snap-on type, molded PVC jacket cover. Fittings and accessories to be covered include, but not limited to, 45 and 90-degree elbows, tees, reducers, increasers, valves, check valves and unions.

E. Equipment, tanks, etc. shall be insulated with closed cell, flexible electrometric thermal sheet insulation, black in color, equal to Armaflex AP 2000. Thickness shall be in accordance with ASHRAE 90.1

F. Above ground exterior piping shall be equal to Foamglass with 0.29K factor @ 75°F, maximum service temperature of 900°F and 7.5 lb/ft^3 density equal to Pittsburgh Corning system with factory formed aluminum jacket.

1. Fittings for above ground exterior piping shall be machine formed, routed and fitted for specific size fitting.

G. Below ground exterior piping shall be of same materials as F except without aluminum jacket.

2.2 Insulation Finish Materials:

A. White All Service Jacket (ASJ).
B. Glass fabric equal to Foster Mast-A-Fab.
C. Smooth Aluminum 0.016-inch thickness and 0.032 inch thickness for exterior use.
D. Aluminum fittings for elbows, tees and devices, precision formed, smooth and mar-free finish, 0.024 inches thick.

2.3 Adhesives:

A. An air-drying contact adhesive specifically designed for joining seams and ends of Armaflex AP-2000 equal to Armstrong 520 Adhesive.

2.4 Finishes:

A. A white elastomeric, UL classified outdoor grade, vinyl mastic for finished outdoor insulation. Water based latex enamel; equal to WB Armaflex Finish.

PART 3 — EXECUTION

3.1 Workmanship:

A. All materials shall be applied by workmen skilled in this trade. Unsightly work shall be cause for rejection.
B. Work shall be fastened, joined, adhered per the manufacturer's requirements.
C. Materials shall be applied only after systems have been tested and all surfaces are clean and dry.
D. Cellular glass block supports or other suitable non-compressible insulation material equal in thickness to the insulation and three times the pipe diameter in length shall be installed at hangers. Provide 18 gauge, 180 degree, galvanized sheet metal saddles under glass block supports.

E. All joints, laps, breaks, and faults in vapor barriers of insulations covering cold surfaces, shall be thoroughly sealed.
F. Insulation that becomes wet for any reason shall be removed, replaced and resealed at the expense of this Contractor.
G. Piping systems requiring testing to be witnessed by the Engineer shall not be insulated until such systems have been tested and approved.
H. Do not insulate any moving parts, valve handles, etc.

3.2 Application:

A. Insulation Application Schedule:

Pipe Size	Interior Space	Exterior Above Grade	Below Grade / Slab
1/2" – 1"	1"	1"	1"
1-1/4" – 2-1/2"	1"	1-1/2"	1"
3" and above	1-1/2"	2"	1-1/2"

B. Rigid Fiberglass Insulation (For interior domestic cold, hot and recirculating):
   1. Piping: All insulation shall be butted together and securely stapled in place (if required by the manufacturer) with outward clinching staples on 3" centers on the lapping seams. Factory provided laps of ASJ tape of same type as jacket on insulation shall be used on joints.
   2. Fittings: Fittings shall be molded fiberglass with snap on PVC jacket and matching white tape on adjacent pipe insulation.
   3. Insulation joints and buts shall be beveled at 30 degrees and sealed with two coats Childers CP-30.

C. Rain Leaders and/or Emergency Rain Leaders:
   1. Insulation Thickness Schedule:

Pipe Size	Exposed Conditioned Space	Exposed Non-Conditioned Space	Concealed within Building Insulation Barrier	Concealed Outside Building Insulation Barrier
3" and 4"	1"	1"	1-1/2"	2"
6" – 10"	1"	1-1/2"	1"	2"
12" – 16"	1-1/2"	2"	1-1/2"	2-1/2"
18" – 24"	2"	2-1/2"	2"	2-1/2"

   2. Rain leaders and emergency rain leaders horizontal portions are to be insulated. Insulation will continue up to the roof drain hub joint. The roof drain hub and pan and any area surrounding the roof drain exposed shall be insulated by this Contractor.
   3. Piping: All insulation shall be butted together and securely stapled in place (if required by the manufacturer) with outward clinching staples on 3" centers on the lapping seams. Factory provided laps of ASJ tape of same type as jacket on insulation shall be used on joints.
   4. Fittings: Fittings shall be molded fiberglass with snap on PVC jacket and matching white tape on adjacent pipe insulation.
   5. Roof drain hubs and pans to be insulated. Miter cut the insulation to fit and glue into place.
   6. Insulation joints and buts shall be beveled at 30 degrees and sealed with two coats Childers CP-30.

D. Traps on Condensate Receiving Floor Drains Above Grade:

1. Insulation shall be cut and formed to the contours of the hub and wrapped around pipe. Factory adhesive shall be used to seal the mitered joints and connection.

E. Storage Tanks:
   1. Hot water storage tanks shall be wrapped with Owens Corning Flexwrap insulation. Cut the insulation and strip off a 3" wide strip for the overlap. Wrap the insulation around the tank and verify that the insulation is butted. Attach the 3" wide overlap with outward clinching staples spaced 3 inches O.C. Cut neatly for all penetrations and seal off any tears, joints or staples with ASJ jacket tape of same materials.

F. Hot Water Piping Below Grade:
   1. Provide Foamglass insulation for underground hot water piping as specified above. Underground piping insulation shall be applied over a clean dry surface.
   2. Underground fittings shall be installed as described above.

G. Cold, Hot Water, Hot Water Re-Circulating and Non-Potable Water Piping Above Exterior Grade Exposed and Concealed:
   1. Above grade exterior cold and hot water shall be insulated with Foamglass as specified above.
   2. Piping: All insulation shall be applied over a clean dry surface. Factory provided laps of ASJ tape of same type as jacket on insulation shall be used on butt joints. All laps and penetrations shall be sealed with a vapor barrier mastic finish.
   3. Fittings: Fitting insulation shall be covered with two coats of vapor barrier mastic.
   4. All above grade exterior piping shall be covered with aluminum jacketing. Aluminum shall be applied to a clean dry surface. Overlap butt joints 4" and apply 1/2" wide bands of aluminum on 8" O.C. and at each end of fittings. On exterior piping, the longitudinal seam shall be located at the bottom center of piping and turned 1/4" down for a drip edge. All joints on exterior piping shall be made water tight with exterior grade silicone caulking.

H. All interior exposed piping and fittings shall be wrapped with PVC insulating jacketing equal to Pittsburg Corning Zeston 2000 and Zeston 300.

3.3 Miscellaneous:

A. This Contractor will contact the Engineer prior to start of all phases of work as follows:
   1. Installation of underground insulation.
   2. Exterior above grade installation.
   3. Interior insulation installation.

B. The Engineer will ascertain the continuation of work subject to the requirements aforementioned.

END OF SECTION 22 07 10

SECTION 22 11 10 — DOMESTIC WATER PIPING

PART 1 — 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: Provide all materials, labor, administration and services required for complete installation of all domestic water piping indicated on Drawings and specified in this section.
- A. Work to Include: All domestic water service and piping to all fixtures and equipment.

1.3 References:
- A. All plumbing Work shall be in accordance with the latest edition of governing codes, ordinances, and or regulations of city, county, state, utility provider, and or authority having jurisdiction. Where local codes are not applicable, conform to the latest International Code Counsel requirements.

1.4 Submittals:
- A. Submit complete product and performance data for all materials listed under this section.
- B. All materials shall be new, without defect, unless specifically noted or specified otherwise.
- C. The supplier, by submitting, certifies the materials and equipment to be satisfactory for the application of this Work.
- D. Contractor agrees that if deviations, discrepancies or conflicts between submittals and the Contract Documents are discovered either prior to or after submittals are processed by the Engineer, the Contract Documents shall supersede.

PART 2 — PRODUCTS

2.1 Domestic Water Piping System:
- A. All plumbing systems shall be equipped with a pressure reducing valve at the building's water service entry. Pressure reducing valve and accessories is specified below.
- B. Buried, Exterior:
  1. Copper Pipe, 3-1/2" and Smaller: Type K hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass.
     a) Joints: Hard temper with brazed joints.
  2. Ductile Iron Pipe, 4" and Larger: Cement lined, per ANSI/AWWA C151/A21.51.
     a) Joints: Shall be mechanical type.
  3. Buried, Exterior:
     a) Polypropylene Pipe (All Sizes):
        (1) Pipe shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The

pipe shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipe shall be made in a three layer extrusion process. Domestic hot water and heating piping shall contain a fiber layer (faser) to restrict thermal expansion. All pipe shall comply with the rated pressure requirements of ASTM F 2389. All pipe shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.

(2) Underground Piping: Polypropylene (PP-R) piping in SDR 7.4.

(3) Install hangers and supports at intervals specified in the applicable Mechanical Code and as recommended by pipe manufacturer.

(4) Support vertical piping at each floor and as specified in the applicable Mechanical Code.

(5) Fire stopping shall be provided to both be compatible with the Aquatherm Piping and meet the requirements of ASTM E 814 or ULC S115, “Fire Tests of Through-Penetration Firestops”. Pipe insulation shall be terminated 3 to 6 inches from where the pipe passes through a fire stop, as recommended by the fire stop manufacturer.

(6) Pipe shall be Greenpipe available from Aquatherm, Inc. or prior approved equal.

(7) Fittings:

(a) Fittings shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The fittings shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All fittings shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.

(b) Install fittings and joints using socket-fusion, elecrofusion, or butt-fusion as applicable for the fitting type. All fusion-well joints shall be made in accordance with the pipe and fitting manufacturer’s specifications and product standards.

(c) Fusion-weld tooling, welding machines, and electrofusion devices shall be as specified by the pipe and fittings manufacturer.

(d) Prior to joining, the pipe and fittings shall be prepared in accordance with F 2389 and the manufacturer’s specifications.

(e) Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer’s specifications.

(f) Fittings shall be Greenpipe available from Aquatherm, Inc. or prior approved equal.

(8) Valves:

(a) Valves with PP-R bodies shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The valves shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.

(b) Valves with brass bodies shall be manufactured in accordance with the manufacturers specifications and shall by certified by NSF International as complying with NSF 61.
(c) Valves shall be Aquatherm® Fusiotherm® available from Aquatherm, Inc. or prior approved equal.

(9) Warranty:
(a) Manufacturer shall warrantee pipe and fittings for 10 years to be free of defects in materials or workmanship.
(b) Warrantee shall cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system do to defects in materials or workmanship.

b) Testing: Testing shall be performed, documented and submitted per the manufacturer's requirements.

C. Buried Below Slab:
1. Copper Pipe: Type K soft copper per ASTM B-88 with continuous protective plastic cover.
a) Fittings: Wrought copper or lead free cast brass.
b) Joints: All joints below slab shall be hard temper with brazed joints.
2. PEX Piping:
a) PEX-A piping (SDR9 crosslinked polyethylene manufactured using the Engel method) shall be acceptable if the following is met: (Note: Clip Ring PEX will <u>not</u> be allowed)
(1) Minimum degree of cross-linking shall be between 70-89% when tested in accordance with ASTM D2765, Method B.
(2) Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent, third-party agency.
(3) Piping to have a minimum material designation of PEX 5106.
(4) Potable water piping shall comply with NSF 14 and NSF 61 and bear the "NSF-pw" marking.
(5) Temperature and pressure requirements in accordance with PPI TR-3: 73.4°F at 80psi, 180°F at 100psi and 200°F at 80psi.
(6) Pipe shall be PEX-A ProPex available from Uponor or prior approved equal.
b) Joints: Manufactured Joints shall be ASTM F1960 cold-expansion type and must comply with the following:
(1) 20% glass-filled polysulfone as specified in ASTM D6394
(2) Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D6394
(3) Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D6394
(4) Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D6394
(5) Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping and marked "F1960".
(6) Potable water fittings shall comply with NSF 14 and NSF 61 and bear the "NSF-pw" marking.
(7) All threaded fittings shall be lead free brass.
(8) Fittings shall have the same inside diameter as the piping.

D. Above Grade:

1. Copper Pipe: Type L hard drawn copper per ASTM B-88.
   a) Fittings: Wrought copper or cast brass.
   b) Solder: Lead-free, tin-silver solder.
   c) Notes:
      (1) Mechanically formed pull Tees and field brazed Tee connections will not be allowed on metallic piping. All fittings must be factory fabricated.
      (2) Copper press fittings on above grade copper piping will be allowed. System shall be Viega "Pro-Press" system, factory copper fittings with EPDM 'O' rings secured with factory approved crimping tools, jaws and crimp rings.

2.2 Dielectric Fittings:

A. Insulating Material: Suitable for system fluid, pressure, and temperature.
B. Dielectric Unions, Nipples, Couplings and Flanges: Shall be of brass material rated for applicable service. Dielectric fittings with EDPM type materials will not be allowed. The fitting will be all brass compression type.

2.3 Domestic Water Specialties:

A. Pressure Reducing Valves (PRV): All plumbing systems shall be equipped with a pressure reducing valve at the building's water service entry. PRV shall be equal to Zurn model ZW209 and shall be line size unless otherwise noted. Provide full port ball valve, union and strainer at inlet of PRV and union and full port ball valve at outlet of PRV.
B. Backflow Preventer (BFP): All plumbing systems shall be equipped with a lead free backflow preventer at the building's water service entry. BFP shall be equal to Watts LF007 with strainer and shall be line size unless otherwise noted.
C. Vaults (if called for on the drawings) shall be as manufactured by Eagle Wholesale series 9648, 96" x 48" x 48" deep (unless a different length is provided on the drawings), pre-cast reinforced concrete vault. Frame and lid to be Eagle series 9648 with optional hydraulically assisted two-piece aluminum doors. Door locks and hinges to be stainless steel. Frame channel to be self-draining to grade. Drain to be installed from the frame channel horizontally thru the side of the vault. Vault shall be factory fitted with the backflow preventer and pressure reducing valve and piping thru the vault walls for connection by the Plumbing Contractor. Pipes within the vault to be class 350 cement lined ductile iron. Vault installation shall be as detailed on the drawings. Permanent ladder / steps shall be provided within vaults deeper than 4 feet below grade.
D. Water Hammer Arrestors (WHA): ASSE 1010; sized in accordance with PDI WH-201, piston type, suitable for operation to 250°F a maximum working pressure of 350 psig. WHA shall be Sioux Chief 650 series or prior approved equal.
E. Provide circuit setters equal to Circuit Solver stainless steel thermostatic balancing valve.
F. Hot water recirculation pump(s) shall be Bell & Gossett model ecocirc XL 15-75 lead free bronze body with stainless steel impeller and shaft, 1/6 HP 120/1V, 0.1 to 2.3 Amps.
G. Thermal Expansion Tanks: Amtrol model Therm-X-Trol, or prior approved equal, bladder or diaphragm type, rated for potable water systems. Size shall be as Scheduled or indicated on the Drawings. Tank shall be ASME rated whenever the water heater or storage tank for the respective hot water system is indicated to be ASME rated.

H. Gauge Cocks shall be brass valves with 1/4" NPT female connections and handles. Valves shall be suitable for 200 psi. Gauge Cock shall be Trerice model 865 or equal.

I. Pressure gauges shall have type 316 stainless steel interior and exterior construction. Windows shall be glass. Gauges shall have 4" dials with white faces and black graduations. Gauge ranges shall be selected so that the normal operating point is approximately 50% but shall not exceed 75% of scale. Unit of measure shall indicate psi. All gauges shall be provided with a pulsation damper, snubber or similar device to dampen pulsation surges. Gauges shall have 1/4" NPT bottom outlets. Weiss style NF4S-2 or prior approved equal.

J. Thermometers shall be Weiss model DVU35 or prior approved equal. Thermometer case shall be constructed of hi-impact ABS, 3/8" LCD digits, wide ambient formula, 1% of reading or 1° accuracy whichever is greater, resolution shall be 1/10° between -19.99/199.9°F, 10 second update, ambient operating range -30/140°F, glass passivated thermistor. Thermometer stem assembly shall be ASME B40.3 compliant. Sockets on insulated pipes shall have extensions of adequate length to clear insulation.

K. Service valves 1/2" thru 4" shall be full port 1/4 turn brass ball valves, two-piece construction, threaded end connection, with PTFE seats and seals, adjustable stem packing gland, stem o-ring and steel handle with vinyl sleeve. 1/2" thru 2" valves shall be pressure rated at 600 psi WOG and 150 psi WSP. 2-1/2" and 3" valves shall be pressure rated at 600 psi WOG and 125 WSP. Valves shall be Kitz series #58 or prior approved equal. All valves shall be furnished with valve handle extensions.

L. Check valves shall be bronze body horizontal swing wye-type with renewable seat and disc, screw cap, threaded end connections, pressure rated at 200 psi non-shock cold working pressure. Valves shall be Nibco T-413-Y-LF or prior approved equal.

M. Strainers shall be bronze body with tapped retainer cap and closure plug, threaded end connections, 20 mesh strainer screen, pressure rated at 400 psi WOG and 125 psi WSP. Strainers shall be Watts series LF777 or prior approved equal.

N. Piping inside chase areas shall be supported with bracketing system equal to Sioux Chief Grid Iron series. System shall include, but not be limited to, a center span bracket, two end bracket clamps and necessary retaining brackets to support the copper piping. Where piping is supported off the vent system, the vent piping shall be bracketed to the inside chase wall. Stainless steel clamps shall be incorporated into the support system when connections are made to the PVC piping.

2.4 P & T Relief Piping:

A. Above Slab:

1. Copper Pipe: Type L hard drawn copper per ASTM B-88. Fittings: Wrought copper or cast brass. Solder: Lead-free, tin silver solder.
2. Relief piping terminating outside the area of the installed water heater shall be installed with an air gap. The air gap shall be Watts model 909, 1" in-line type, and installed at the water heater below the T & P relief valve.

2.5 Primer Drain Piping (when applicable):

A. Above Slab:

1. Copper Pipe: Type L hard drawn copper per ASTM B-88.
   a) Fittings: Wrought copper or cast brass.
   b) Joints: Lead-free, tin-silver solder.

B. Below Slab:

1. Copper Pipe: Type L soft drawn copper with no fittings or joints below the slab. Provide continuous protective plastic covering.

PART 3 — EXECUTION

3.1 General:

A. Work shall be installed so that all exposed piping will be straight and true without bends or off-sets.
B. Water supplies shall connect through walls with stops and chrome plated escutcheons with setscrews. Split ring escutcheons will not be allowed.
C. Installation dimensions shall be taken from the Architectural Drawings.

3.2 Domestic Water Piping:

A. Provide a complete domestic water piping system including interior and exterior work as indicated.
B. Piping shall be run as directly as possible, avoiding all unnecessary fittings and joints. Changes in routing of piping due to field conditions shall be at the expense of this Contractor.
C. Piping shall be accurately cut to measurements established at the project site, worked into place without springing or forcing, run as directly as possible, run parallel or perpendicular to building lines, located as indicated on the Drawings and supported as specified elsewhere. Parallel piping shall be grouped together as much as practical. Piping shall be supported as high as practical. Piping shall be concealed unless noted otherwise.
D. Contractor shall provide for expansion and contraction of piping systems. Expansion and contraction of piping shall not impart excess stress or strain on the building, pipe fittings, joints or connections to equipment.
E. Provide sleeves for all piping penetrations under or through footings, foundation walls, grade beams, floors above grade and walls. Sleeves for insulated piping above grade shall be sized for the insulation diameter. Annular space between the insulation and sleeve shall be sealed or fire caulked as detailed on the drawings. Sleeves shall be 2 pipe sizes larger than the service pipe.
F. Piping thru slabs on grade shall be protected with 1/2" thick Armaflex closed cell foam insulation a minimum of 6 inches above and below slab. Wrap all pipes below slab in an approved jacketing material.
G. Piping installed below grade shall have a minimum of 24" cover. See other sections for trenching and backfill requirements.
H. Provide solid type chrome escutcheon plates at each exposed piping penetration of walls and ceilings and inside casework.
I. Provide shutoff valves at each branch from main. Provide shutoff valves for each fixture group to minimize interruption of service for maintenance and repair. Provide an exterior main shutoff valve and valve box as indicated on drawings. Provide area shut-off valves as necessary to facilitate testing and isolation of piping where tested and approved pipes are put into service.
J. Piping thru metal studs, structural members, etc. shall be isolated from metal to metal contact with plastic bushings specifically designed for the application.

3.3 Trap Primer Drains (when applicable):

A. Provide a complete system of drains as indicated on the floor plans from the primer assembly to the floor drain/hub drain connections.
B. Piping below slabs shall be installed in the gravel bedding below the concrete flooring and held as level as possible. Piping to be sleeved with an approved protective covering.

3.4 Testing:
A. Water piping systems shall be subjected to a hydrostatic test of 125psig or 1-1/2 times operating pressure whichever is greater.
B. All piping shall be tested before being insulated or concealed. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory.
C. Provide test report showing all field tests performed to prove compliance with the specified criteria. The testing report shall be bound or submitted in PDF format. Report shall be submitted and approved prior to final payment. The report shall include the following:
   1. Date of test.
   2. Persons present.
   3. System tested.
   4. Test medium.
   5. Pressure tested.
   6. Lines tested and location.
   7. Duration of test.
   8. Pressure drop.
D. This Contractor shall conduct all specified tests until approved by the Engineer. All tests shall be repeated until approved by the Engineer. Piping systems shall not be covered or otherwise concealed until tests inspections have been made and approvals obtained. This Contractor shall notify the Engineer four days prior to testing to allow for scheduling. If the Engineer is called for an observation and the Engineer finds the work not ready or the test failed, this Contractor shall reimburses the Engineer at the Engineer's standard hourly rate.

3.5 Sterilization of Domestic Water Piping System:
A. The entire system shall be flushed for a minimum of two hours and then drained prior to sterilizing by the following method or other methods satisfactory to the Engineer and the Authority Having Jurisdiction.
B. Fill piping system with a 50 ppm chlorine solution. Open and close all valves to thoroughly distribute solution thru all piping. Allow solution to stand for 24 hours then test for residual chlorine at the ends of the system. If less than 25 ppm is indicated, repeat the sterilization process. When tests show at least 25 ppm of residual chlorine, flush out the system until all traces of chlorine is removed. Open and close all valves in system several times during flushing period.
C. The Engineer reserves the right to test, or have, the water tested again at any time prior to final acceptance of the work. If found to be unsafe, the Contractor shall re-chlorinate the system until the water is proven equal to that supplied by the public system. It is the responsibility of this Contractor to ensure the water is equal to that supplied by the public system.
D. Contractor shall arrange for laboratory testing for a bacteriological examination of potable water system at various locations. The samples shall be tested to meet

requirement of the AHJ and shall not be of less quality than provided by the public system. Submit a copy from testing agency prior to submitting for final payment.

E. Minor work such as repairs or replacement of a single fitting or valve, shall be pre-cleaned and disinfected by immersion in solution of 300 ppm chlorine for 1 hour.

3.6 Final Acceptance:

A. Before final acceptance, this Contractor shall furnish a certificate of inspection and final approval from the AHJ to the Owner and be in accordance with the latest revisions of the applicable Codes and the Approved Plumbing Drawings and Specifications. Contractor shall also furnish report of test, sterilization compliance and backflow device(s) certificates.

END OF SECTION 22 11 10

SECTION 22 13 10 — SANITARY SEWER PIPING SYSTEM

PART 1 — 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: Provide all labor, materials, accessories, equipment, administration and perform all operations required for the correct installation of all sanitary sewer piping systems indicated on Drawings and specified in this section.

A. Work Included: All sanitary sewer piping and equipment indicated throughout the building and extension of the sanitary sewer to the indicated termination point.

1.3 References:

A. All plumbing installation and fabrication shall be in accordance with applicable State and Local Plumbing Codes.

1.4 Submittals:

A. Submit catalog data and Shop Drawings for all materials and equipment listed under this section. Include submittal data on related specifications as applicable.
B. Materials or equipment installed without review or after rejection shall be replaced with new by this contractor at no additional cost to other parties.
C. All materials and equipment shall be new and without defect unless specifically noted or specified otherwise.
D. The supplier certifies the materials and equipment to be satisfactory for the application involved.
E. The Contractor agrees that if deviations, discrepancies or conflicts between submittals and specifications are discovered either prior to or after submittals are processed by the Engineer, the Contract Documents shall supersede.

PART 2 — PRODUCTS

2.1 Sanitary Sewer Piping System:

A. Buried, Exterior and Below Slab:
    1. Cast Iron Pipe: ASTM A-74 spun service weight.
        a) Fittings: Cast iron.
        b) Joints: Hub-and-spigot, compression type with ASTM C-564 neoprene gaskets.
    2. PVC Pipe and Fittings: Schedule 40 per ASTM D-1785 / ASTM D-2665.
        a) Joints: Solvent weld per ASTM D-2855 with solvent per ASTM D-2564.
    3. Provide sleeves for all piping penetrations under or through footings, foundation walls, grade beams, floors above grade and walls. Sleeves for insulated piping above grade shall be sized for the insulation diameter. Annular space between the insulation and sleeve shall be sealed or fire caulked as detailed on the

drawings. Sleeves shall be 2 pipe sizes larger than the service pipe. Coordinate with the Architectural and Structural drawings for locations.

4. This Contractor shall provide and install all cast iron pipe for all kitchen waste systems.

B. Above Slab, Interior:
   1. Cast Iron Pipe: ASTM A-888 spun service weight. Cast iron fittings and joints shall be no hub. Couplings shall be CISPI Standard No. 310-95 with corrugated stainless steel shield and 4 stainless steel retaining bands with 5/16" worm gear hex head socket. Couplings shall be Husky HD 2000.
   2. PVC Pipe and Fittings: Schedule 40 per ASTM D-1785 / ASTM D-2466.
      a) Joints: Solvent weld per ASTM D-2855 with solvent per ASTM D-2564.
   3. This Contractor shall provide and install all cast iron pipe at all fire rated assemblies, continuous floor to floor through assemblies. This Contractor shall provided and install cast iron pipe in return air plenums and where indicated on the Drawings. This Contractor shall coordinate with Contract Documents for compliance. This Contractor shall provide and install all cast iron pipe for all kitchen waste systems.

2.2 Sanitary Sewer Specialties:
   A. Cleanouts: Cleanouts shall be the same nominal size as the pipe served up to 4" and not less than 4" for line sizes greater than 4".

2.3 Sanitary Sewer System Insulation:
   A. All sanitary piping exposed in or installed over unheated spaces shall be insulated. Exposed floor drain bodies and P-traps shall be insulated.
   B. Insulation shall be 1" thick, jacketed fiberglass. See Section 22 07 10 for additional information.

PART 3 — EXECUTION

3.1 General:
   A. Installation dimensions between partitions or walls shall be acquired from the Architectural Drawings. Work shall be roughed-in so that all exposed piping will be straight and true without bends or off-sets.

3.2 Sanitary Sewer Piping System:
   A. Provide a complete system of sanitary sewer drain, waste and vent piping including interior and exterior work as indicated.
   B. Piping up to 2-1/2" shall be sloped at least 1/4" inch per foot. Piping 3", 4" and 6" shall be sloped at least 1/8 inch per foot. Piping 8" and larger shall be sloped at least 1/16 inch per foot.
   C. Provide cleanouts as required by Code and as indicated on the Drawings. Provide two way exterior cleanouts within 5 feet of the building. Interior cleanouts in floors shall be flush with finished floors. Interior cleanouts in walls shall be above the flood level of plumbing fixtures. Exterior cleanouts in unpaved areas and areas paved with other than concrete shall be set in concrete pads flush with finished grade as detailed on the drawings. All Clean Outs are to be the same size as the pipe they serve.

D. Vents through roof shall be a minimum of 3 inches in diameter and shall terminate at least 12 inches above the roof. This Contractor shall review all Drawings and ensure vent termination is a minimum of 10 feet from any door, window or outside air inlet.
E. Drainage piping shall be installed with hubs upstream of each pipe section. Provide reducing fittings where different sizes of pipe are to be connected. Bushings shall not be used. Provide longsweep fittings, sanitary tees and combination wyes with 1/8 bends as applicable.
F. Escutcheons shall be provided on exposed wall penetrations. Escutcheons shall completely cover the piping, insulation and penetration. Escutcheon shall be single piece construction with chrome finish.
G. Interior wall cleanouts shall have stainless steel wall covers sized for the cleanout and covering the wall opening. Cleanout covers shall be installed flush with the wall.
H. Back to back water closets shall be installed with double combination wye with 1/8-bend. Double sanitary tees and double fixture fitting will not be allowed.

3.3 Testing:
A. All piping shall be tested before being insulated or concealed in any manner. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory.
B. All waste and vent piping shall be subjected to a hydrostatic test of not less than a 10-foot head. Piping shall be tested for not less than 4 hours, prior to installing fixtures. Underground piping shall be tested before backfilling.
C. All vent piping shall be smoke tested.

3.4 Cleaning:
A. At completion of all work, fixtures, exposed materials and equipment shall be thoroughly cleaned.

3.5 Final Acceptance:
A. Before final acceptance, the Plumbing Contractor shall furnish a certificate of inspection and final approval from the AHJ to the Owner and be in accordance with the latest revisions of the applicable codes and the approved Plumbing Drawings and Specifications. Contractor shall also furnish a report of test and backflow device certificates.
B. Provide test report showing all field tests performed to prove compliance with the specified criteria. The testing report shall be bound or submitted in PDF format. Report shall be submitted and approved prior to final payment. The report shall include the following:
   1. Date of test.
   2. Persons present.
   3. System tested.
   4. Test medium.
   5. Pressure tested.
   6. Lines tested and location.
   7. Duration of test.
   8. Pressure drop.
C. This Contractor shall conduct all specified tests until approved by the Engineer. All tests shall be repeated until approved by the Engineer. Piping systems shall not be covered or otherwise concealed until tests inspections have been made and approvals obtained. This Contractor shall notify the Engineer four days prior to

testing to allow for scheduling. If the Engineer is called for an observation and the Engineer finds the work not ready or the test failed, this Contractor shall reimburse the Engineer at the Engineer's standard hourly rate.

END OF SECTION 22 13 10

SECTION 22 42 10 — PLUMBING FIXTURES

PART 1 — 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: Provide all fixtures, labor, materials, equipment, administration, balancing and services required for complete installation of all plumbing fixtures indicated on Drawings and specified within this section.

1.3 References:
- A. All plumbing installation and fabrication shall be in accordance with applicable State and Local Plumbing Codes and project funding requirements.

1.4 Submittals:
- A. Submit catalog data and shop drawings for all materials and equipment listed under this section.
- B. Materials, fixtures, or equipment installed without review or after rejection shall be replaced by this Contractor with Basis of Design items.
- C. All materials, equipment, and appliances shall be new, without defect, first line quality unless specifically noted or specified otherwise.
- D. The supplier, by submitting, certifies the materials and equipment to be satisfactory for the application involved.
- E. Contractor further agrees that if deviations, discrepancies or conflicts between submittals and specifications are discovered either prior to or after submittals are processed by the Engineer, the design drawings and specifications shall supersede.

PART 2 — PRODUCTS

2.1 Plumbing Fixtures – General:
- A. Provide all plumbing fixtures complete with trim required, and connect in a manner conforming to the Local, State and International Building Codes. Certain fixtures may be furnished by others under other sections of these Specifications. Provide rough-in and final connections including all valves, traps, specialties, etc. required.
- B. Provide traps for all waste connections where not furnished with the equipment and stop cocks or valved shut-offs for all water connections to all sinks and other items of equipment. All exposed pipe and metal, including that within cabinets, shall be chrome plated cast brass with the same gauge thickness as the specified trap. Stainless steel bell escutcheons shall be installed covering the hub connections below sinks and lavatories and extend to the wall or back of cabinet for a tight fit.
- C. Quality and Type of Fixtures:
  1. Plumbing fixtures, carriers, etc. are specified by manufacture and model numbers for the purpose of establishing type and quality. Equals must be pre approved by

the Engineer. Pre approval submittals must be received by this office no later than 10 working days before the job bids.

2.2 Fixture Schedule:

A. P-1 Water Closet Tank Type (ADA Accessible): Kohler model K-3999, 1.28 gal/flush, 16.5" high, white, floor mounted elongated, 2-1/8" fully glazed trap-way and bolt caps. Install with Olsonite model 10CTSS solid plastic open front seat with stainless steel self-sustaining check hinge. Coordinate lever hand side with Architectural Drawings. Lever shall be away from the wall.

B. P-2 Lavatory: Undermount Kohler vitreous china with overflow, 19-1/4" x 16-1/4", fully undercoated, with overflow. Provide and install Kohler model K-15182 faucet. Install McGuire No. 155WC offset grid drain, 17-gauge cast brass chrome plated trap with cleanout & Zurn Z-8804-LR-LK supplies with stops. Insulate the water and waste pipes below the lavatory with TrueBro Lav Guard2 EZ series molded vinyl covering, white finish, latex paintable, with reusable internal snap clip fasteners. See casework drawings. Provide Powers LFLM495 series, point of use mixing valve with a maximum discharge temperature of 105°F to 109°F. Mixing valve shall have a wall mount and be mounted to the wall tucked up and behind the waste and water piping and shall not be mounted loose.

C. P-3 Bi-Level Electric Water Cooler with Bottle Filling Station: Elkay model LZSTL8WSLP, wall mounted, dual unit, 120 volt, 370 watts, 8 gallons per hour cold water, with filtration system and bottle filling station, stainless steel basin and shrouds. Install with Zurn model Z1225-BL dual plate carrier, 17 gauge cast brass chrome plated trap and Zurn Z-8804-LR-LK supplies with stops. Unit mounting height shall be as selected by the Architect. See interior elevations. Anchor the cooler firmly to the carrier plates on top and bottom. Refrigeration system shall have a 5-year warranty. Four (4) additional replacement filters shall be furnished with the cooler.

D. P-4 Two Compartment Sink (Undermount): Elkay model EFRU311810, 30-3/4" x 18-1/2" with two 13-1/2" x 16" x 10" deep compartments, 18-gauge stainless steel, under counter mounted, fully undercoated. Install with model LKD2433C mixing faucet with retractable spray, two model LK-99 stainless steel strainers, Zurn Z-8804-LR supplies with stops, 17 gauge cast brass chrome plated trap. Provide Powers LM495 series point of use mixing valve with a maximum discharge temperature of 120°F. Furnished and installed In-Sink-Erator model 777ss stainless steel garbage disposer, continuous feed, dual direction. 1 hp 120 volt, with stainless steel grind chamber and grinding elements, fully insulated outer shell & 1-piece stainless steel stopper. Disposer shall have a 7-year warranty.

E. P-5 Mop Sink: Fiat model TSBC 1610 Neo-Corner, 24"x 24" x 12" deep pre-cast terrazzo sink, with stainless steel caps on drop front, 3" deep seal trap, stainless steel strainer, quick drain connector, stainless steel wall guard, three-mop hanger and 30" long flexible hose with hose mounting bracket. Seal the sink to the wall and floor with silicone sealant prior to installing the stainless steel wall guard. Install Delta 28C2383 cartridge faucet with body mounted vacuum break, garden hose end, 3" lever handles and wall support bracket. Mount the mixing faucet 42" above the floor. Mount the mop hanger 5' above the floor on the opposite wall of the faucet or as shown on Architectural Drawings.

F. P-6 Ice Machine Filter Assembly: Oatey 38608 wall box with faceplate, 1/4 turn valve with integral water hammer arrestor. Provide and install Manitowoc Artic Pure model AR-10000, 1 micron 10,000 gallon capacity assembly with pressure gauge and wall mounting frame. Furnished with the filter assembly shall be 4 spare filters. Plumbing

Contractor shall be responsible for furnishing the 3/8" copper tubing connector between the filter housing and ice machine.

G. P-7 Exterior Wall Hydrant: Zurn Z1320-C-NB-WC, anti-siphon, non-freeze, automatic draining with vacuum breaker, integral backflow preventer, wall clamp assembly, polished nickel bronze finish and furnished with loose key operator. Install tight to wall and caulk weather tight. Coordinate operating rod depth with wall thickness and building insulation location.

H. P-8 Electric Water Heater: AO Smith model DEL-20, 20 gallon with 1-3,000 watt elements at 208/1/60, foam insulated, baked enamel lined, operating and safety controls, vacuum breaker and AGA/ASME T&P relief valve. Tank shall have a 3 year warranty. Provide an Amtrol Therm-X-Trol ST-12 expansion tank.

I. P-9 Circulation Pump: Bell & Gossett model NBF-22, Lead Free Bronze body, 92 Watts, 0.8 FLA, 2940 rpm, 115/1/60, 5 GPM at 15' head pressure external to the mixing station. Circulation pumps shall be factory mounted and piped. Control from a pipe mounted immersion Aquastat. Provide lead free circuit setter at pump to control flow. Contractor shall submit circuit setter balance chart with pressure drop across the circuit sitter prior to substantial completion.

J. P-10 Slot Floor Drain: Zurn model ZS880-72-WG, 4-15/32" wide x 36" long 304 stainless steel floor trench drain with Wave Grate option.

K. P-11 Recessed Floor Drain: Zurn model ZN-415-7I, two-piece cast iron threaded fully adjustable 4" drain body with flashing collar. Install with type "I" 7" diameter polished nickel bronze, heel proof strainer with raised flange, and deep seal trap. Floor drain shall be furnished with a ProSet Systems Trap Guard. Contractor shall remove the strainer and provide a sheet metal construction cover during construction.

L. WCO Cleanout: Provide threaded brass cap and stainless steel cover plate. Plate shall bolt into brass cap.

M. ECO Exterior Cleanout: Zurn model Z1400-K-BP-DC, coated cast iron adjustable body with anchor flange, ductile heavy-duty scoriated secured cleanout cover and internal bronze plug. Install to the listed waste pipe with a Huskey SD4000 coupling with stainless steel connector bands.

PART 3 — EXECUTION

3.1 General:

A. Obtain exact centerline rough-in dimensions between partitions or walls from the Architectural Drawings. Work shall be roughed-in so that all exposed piping will be straight and true without bends or off-sets. Water supplies shall connect through walls with stops and chrome plated escutcheons with setscrews. Where fixtures are without supporting legs or carriers secure wall hangers to bolts welded to 3/16" steel plates, mounted against walls within chases.

B. Where backs of fixtures join wainscoting or tile, the tile shall be ground flat and the joints made close. Apply a smooth bead of paintable white caulking compound around back of fixture at outside edge before final setting. When fixture is set, wipe compound so that joint is sealed smooth.

C. Mount fixtures to the heights above finished floor as indicated on the Architectural drawings.

3.2 Cleaning:

A. At completion of all work, fixtures, exposed materials and equipment shall be thoroughly cleaned and all temporary stickers, markings, etc. shall be removed
B. All strainer screens shall be removed and cleaned. All floor drain strainer screens grid pattern shall match that of the floor covering grid pattern. All lavatory and sink strainers shall align with the geometry of the fixture. This Contractor shall coordinate rough-in work with necessary Trades for compliance.

END OF SECTION 22 42 10

SECTION 23 05 00 — MECHANICAL GENERAL PROVISIONS

PART 1 — 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: Provide all materials, labor, management, equipment, fixtures, start-up, fabrication, services, cleaning, testing and balancing required for complete installation of all provisions indicated on Drawings, Schedules and specified herein.

A. This Contractor shall review all of the Contract Documents including all Drawings and Specifications of all Trades to ensure the complete implementation of Work.

B. Where shown or noted on the Drawings or where called for in other Sections of the Contract Documents, the Contractor for this Division shall install equipment furnished by Others, and shall make required service connections. Contractor shall verify with the supplier of the equipment the requirements for the installation.

C. Where the words "provide", "furnish", "include", or "install" are used in the Specification or on the Drawings, shall mean to furnish, install, and test complete and ready for operation, the items mentioned.

D. Drawings for the Work are diagrammatic, to express the scope of the Work and to indicate the general arrangement and locations of the Work. Due to Drawings constraints, certain items such as pipe fittings, offsets, access panels, devices and sleeves may not be shown. This Contractor shall be responsible for confirming that the devices, piping and equipment fit the space provided. The location and sizes for pipe, fittings, sleeves, access panels and other basic items required by Code and other sections shall be coordinated and included for the proper installation of the work.

E. Specifications may not deal with diminutive installation requirements, parts, controls, and devices required which may be required to produce the equipment performance specified or as required to meet the equipment warranties and applicable Code. Such items shall be included, whether or not specifically called for in the Contract Documents.

F. Coordinate with all Trades in submittal of shop drawings. Shop drawings shall be prepared to clearly indicate all applicable components. Space conditions shall be detailed to the satisfaction of all trades, subject to review and final acceptance by the Engineer. In the event that the Contractor installs work before coordinating with other trades or so as to cause any interference with work of other Trades, the necessary changes shall be made to the work to correct, at no additional cost to the Owner, Architect or Engineer.

1.3 Seismic Restraint / Protection:

A. All Life Safety Rated Systems shall be seismically restrained and protected including sway bracing, flexible couplings, anchoring, etc. Unless otherwise noted on the Drawings, Specifications and or general Contract Documents, the Seismic Site Class shall be "D" and Design Category shall be "C". The seismic design shall be by a competent Professional Engineer licensed in the Project's State. The Professional

Engineer responsible for the seismic design shall have no less than 5 years experience in the design of seismic protection systems. The Contractor installing the seismic protection shall have no less than 5 years experience in the installation of seismic protection systems shall meet the Contractor's Qualifications herein. Seismic designer shall coordinate with Architectural Life Safety Drawings and Structural Engineer / Drawings, prior to bid, and determine the required extent of Seismic restraint / protection.

1.4 Contractors Qualifications:

A. The qualifications of this Contractor shall be as follows:
   1. Contractor must be a licensed General Contractor, specific to this section's Trade, in the project's State.
   2. The Contractor shall have been in the mechanical contracting business for the last five consecutive years, under their current corporation name with more than 75% of the same corporate officers.
   3. The Contractor shall have completed at least two projects of comparable size and scope within the past two years without receipt of a Notice to Cure.
   4. If Contractor has received a Notice to Cure on any project, that Contractor is excluded from performing work on this project.
   5. The Contractor's main construction and service office shall be located within 60 driving miles distance of the project site unless approval, 10 days prior to project bid date, has been issued in writing by the Owner, Architect and Engineer.
   6. The Contractor shall provide substantiating proof of these requirements 10 days prior to project bid date. If substantiating proof is not submitted and approved, the Contractor will not be allowed to bid or work the project.
   7. The General Contractor shall not purchase this Contractor's equipment, materials, etc. All materials, equipment, labor, etc. required to perform the Work herein shall be at the cost of this Contractor.

1.5 Codes and Standards:

A. Conform to latest edition of governing codes, ordinances, and or regulations of city, county, state, utility provider, and or authority having jurisdiction. Where local codes are not applicable, conform to the latest International Code Counsel requirements.
B. Adopted ICC and ASCE 7 where seismic restraint / protection is required.

1.6 Fees, Permits, and Inspections:

A. Secure all permits and pay all fees required in connection with the Work.
B. Coordinate and provide such inspections as are required by the Authorities having jurisdiction over the site.
C. Where applications are required for procuring of services to the building, prepare and file such application with the Utility Company. Furnish all information required in connection with the application in the form required by the Utility Company.

1.7 Active Service:

A. Existing active services; water, gas, sewer, electric, are to be located and shall be protected against damage. Do not prevent or disturb operation of active services which are to remain. If active services are encountered which require relocation, make request to authorities having jurisdiction for determination of procedures. Where existing services are to be abandoned, they shall be terminated in

conformance with requirements of the Utility, Municipality or Authority having jurisdiction.

1.8 Site Inspection:

A. Contractor shall inspect the site to become familiar with conditions of the site which will affect this Contractor's work and shall verify points of connection with utilities, routing of Work to include required clearances from any obstacles.

B. Additional payment will not be provided for changes in the Work required because of Contractor's failure of said familiarization and understanding.

1.9 Openings, Cutting, and Patching:

A. This Contractor shall coordinate required openings in the structure, walls, ceiling, floor roof, etc. with all Trades and applicable Engineers.

B. When additional patching is required due to failure of coordination; provide the patching required to properly close openings including "put back" and painting. Patching must meet the Owner's, Architect's and all applicable Engineer's approval.

C. When cutting and patching of the building is required due to failure to install piping, sleeves, or equipment on schedule or failure to provide the information required for openings, provide the cutting and patching as required. Patching must meet the Owner's, Architect's and Engineer's approval.

1.10 Protection:

A. Equipment and material shall be completely protected from weather elements, painting, plaster, etc. until the project is completed. Damage from rust, paint, scratches, etc. shall be repaired as required to restore equipment to original condition. If repair is deemed unacceptable by the Owner, Architect or Engineer, the equipment, material, device, etc. shall be replaced with new at no additional cost to the Owner, Architect or Engineer.

B. Piping within walls, in particular within studs, shall be protected with 16 gauge metal cover plate, on both sides of stud, equal to Sampson HSS Stud Shoe.

C. Where the installation or connection of equipment requires work in areas previously finished by other Contractors, the area shall be protected and not marred, soiled, or otherwise damaged during the course of such work. Contractor shall arrange with all other Contractors for repairing and refinishing of such areas which may be damaged.

D. When welding is required inside the building, a fire watch shall be provided. The fire watch shall provide adequate protection of existing surfaces and observance of adjacent floors where penetrations exist or are to be made.

1.11 Wiring for Equipment:

A. Electrical work provided under Division 23 shall conform to the requirements of Division 26.

B. Division 26 shall provide power for motors and equipment furnished by this Contractor including safety disconnect switches, starters and final connections. This Contractor is responsible for coordinating with the Electrical Contractor and all other Trades, for wiring that is beyond this Contractor's credentials.

C. Division 23 shall provide all motors, controllers and contactors for equipment furnished under this Division, except where they are to be provided under another Division.

D. Include provisions required for integration into building Life Safety and Building Automation Systems.

E. Coordinate with Division 26 for all equipment which requires electrical services. Provide information as to the exact location for rough-in, electrical load, size, and electrical characteristics for all services required.
F. Where motors or equipment furnished require larger services or services of different electrical characteristics than those called for on the Electrical Drawings, this Contractor shall coordinate with the Electrical Contractor and the Electrical Engineer to provide a larger service as required, the cost of which shall be the responsibility of this Contractor.

1.12 Substitutions:
A. Any equipment, material, etc. submitted as "equal" to the basis of design shall be accompanied with a "one – to – one" comparison letter from the vender stating any differences from the equipment being submitted and the basis of design. A letter is also to be submitted from the vender, on the vender's letterhead, stating that the vender has received a copy of the job all Specifications, Addendums and Drawings.
B. Substitutions for the scheduled and specified equipment shall only be done with the prior approval of the Engineer, and shall be obtained in writing. Prior approvals shall be obtained no less than 10 days prior to the project bid date. Prior approval shall not relieve the contractor of supplying equipment that meets the specifications, capacities, efficiencies, physical dimensions, etc.

1.13 Submittals:
C. General:
1. Submit to Engineer shop drawings and product data required by the Drawings and Specifications.
2. Contractor shall compile all data required to satisfy the Scope of Work implied by the Contract Documents.
3. Submit a minimum of 6 copies of data, more if required by the Architect. Coordinate with Architect and Engineer to verify if Electronic Submittals, i.e. PDF, will be allowed or required prior to bidding the project. If Electronic Submittals are allowed, 2 bound hard copies must be submitted as well as the Electronic file.
D. Submittal Requirements:
1. Review shop drawings and product data prior to submission to Engineer.
2. Submit only complete project submittals. Partial submittals or submittals not complying with the above requirements shall be returned to the contractor un-marked and rejected.
3. Engineer's review is only to check for general conformance with the design concept of the project and general compliance with Contract Documents. No responsibility is assumed by the Engineer for correctness of dimensions, details, quantities, procedures, etc. shown on shop drawings or submittals.
4. In the interest of project expediency the contractor may pre-submit long lead items for pre-approval pending prior approval of the Engineer. However, the Contractor shall not be relieved of including the same data as required by submittal binder and shall be included therein.
5. The Contractor may turn in submittals without control drawings if they require a longer production time. All other items shall be included.
6. If a pre-submittal is made, provide a tab for items not included and include an explanation of why item is not included in the submittal and the expected submittal date.

7. PDF submittals must be searchable and tabbed per section. All devices, materials, etc. that assemble a fixture, system, etc. shall reside in the same tab.
8. Hard copy submittals shall be compiled in a 3-ring, hard bound, loose leaf binder. The face of the binder shall be clearly marked with the project title and number, the name of the Owner, Architect, Engineer, General Contractor and this Contractor.
9. Provide an index, numerically indicating all sections applicable to the submittal.
10. Separate binders shall be provided for HVAC, Plumbing and Fire Suppression trades.
11. Provide tab dividers for each section submitted.
12. If an item appears on the drawings not specifically covered by the specifications, provide an additional numeric tab at the end of the index detailing the item and include the submittal data in the binder. All devices, materials, etc. that assemble a fixture, system, etc. shall reside in the same tab.
13. All equipment included on the submittal sheets shall be marked to indicate the mark of the equipment as shown on the drawings. The equipment shall be high-lighted to clarify which items are being submitted.
14. When required, the contractor will be provided with an electronic copy of this section's Drawings. Shop drawing submittals shall consist of one digital copy in .dwg format and one in PDF format. The drawing's sheet sizes shall be formatted to the same size as the Contract Documents. A digital copy in PDF format shall be returned to the contractor with the Engineer's approval stamp and comments.
15. Verify field measurements, field construction criteria, catalog numbers, and similar data.
16. Notify Engineer in writing of deviations from requirements of Contract Documents at time submittals are made. A "deviation" shall be construed to mean a minor change to the sequence indicated on drawings or specification. A "deviation" is not intended to allow substitutions or product options.
17. Deviations in submittals from requirements of the Contract Documents are not relieved by Engineer's review of submittals, unless Engineer gives written acceptance of specific deviations.
18. Work may not commence until submittals have been returned with Engineer's stamp and signature indicating approval. Materials and equipment that were installed prior to being approved shall be removed and replaced with approved items at no additional cost to other parties.
19. Shop Drawings and or submittals requiring resubmission to the Engineer due to non-compliance with the Contract Documents and or incompleteness shall be thoroughly reviewed by the Contractor prior to delivery to the Engineer for review. The Contractor shall ensure the completeness and compliance of the submittal materials and shall reimburse the Engineer at the Engineer's standard hourly billing rate for review of submittals beyond the second submission.
20. Omission in shop drawings of any materials indicated in Contract Drawings, mentioned in Specifications, Scheduled or required for proper execution and completion of Work, does not relieve the Contractor from responsibility for providing such materials.

1.14 Operating and Maintenance Manuals:

A. General:

1. Provide three "As Built" copies of shop drawings, product data, and other information described in this Section for use in compiling operating and maintenance manuals.
2. Provide legible submittals made by permanent reproduction copy equipment from typewritten or typeset originals.
3. Pre-punch 8-1/2 inch x 11 inch sheets in three ring, hardback, binders.
4. Submit larger sheets in rolled, protected packages.
5. Submit all in a PDF format as well as the hard copy sets mentioned above.

B. Compilation:
1. The Contractor will receive shop drawings, brochures, materials lists, technical data, warranties, guarantees, and other pertinent information and will assemble, catalog, and file information in loose-leaf, hardback three-ring binders.
2. Submittal Format: Provide each of the following items, as applicable, for each required item or system. Refer to specific Specification section requirements.
   a) Item: Use appropriate Section title.
   b) System Description: Provide a detailed description of each system, describing function, components, capacities, controls and other data specified, and including the following:
      (1) Quantity.
      (2) Sizes.
      (3) Type of operation.
      (4) Detailed operating instructions, including start-up and shut-down of each system, with indications for position of all controls, as applicable.
      (5) Wiring Diagrams: Complete wiring diagrams for internally wired components including controls.
      (6) Operating Sequence: Describe in detail.
      (7) Manufacturers Data: Provide catalog data sheets, specifications, nameplate data and parts list.
      (8) Preventative Maintenance: Provide manufacturer's detailed maintenance recommendations.
      (9) Troubleshooting: Provide manufacturer's sequence for trouble-shooting procedures for operational problems.
      (10) Extra Parts: Provide a listing of extra stock parts furnished as part of the Contract.
      (11) Warranties: Provide specific manufacturer's warranty. List each component and control covered, with day and date warranty begins, date of expiration and name, address and telephone number of person to contact regarding problems during warranty period.
      (12) Directory: Provide names, addresses, emails and telephone numbers of Contractor, its subcontractors, suppliers, installers and authorized service and parts suppliers.

1.15 Record Drawings:

A. Detailed Requirements for Record Drawings:
1. During the progress of the work, the General Contractor shall require the job superintendent for the plumbing, air conditioning, heating, ventilating, and fire protection subcontractors to record on their field sets of drawings the exact locations, as installed, of all conduits, pipes, and ducts whether concealed or exposed which were not installed exactly as shown on the contract drawings.

2. Upon completion of the work, this data shall be recorded to scale, by a competent CAD operator in .dwg format of no more than two versions past current. Electronic drawings in .dwg format will be furnished to the Contractor by the Architect/Engineer. Where the work was installed exactly as shown on the contract drawings the .dwg file shall not be disturbed other than being marked "As-Built". In showing the changes, the same legend shall be used to identify piping, etc., as was used on the contract drawings. Separate electronic drawings shall be prepared for plumbing, heating, air conditioning, and ventilating work unless two or more divisions are shown on the same sheets of the contract drawings, in which case the various subcontractors shall also show their changes on the same sheets. Each sheet shall bear the date and name of the Contractor submitting the drawings.
3. The Contractor shall review the completed As-Built drawings and ascertain that all data furnished on the .dwg files is accurate and truly represent the work as actually installed. Where plumbing, hot or chilled water pipes, inverts etc., are involved as part of the work, the Contractor shall furnish true elevations and locations, all properly referenced by using the original bench mark used for the institution or for this project.
4. The Engineer shall authorize the Contractor to produce and distribute the As-Built drawings as follows:
   a) One (1) to the Engineer.
   b) One (1) to the Architect.
   c) One (1) to the Owner.

1.16 Substitutions and Product Options:

A. Products specified only by reference standard, select product meeting that standard in accordance to the projects funding requirements, i.e. Made in the USA.
B. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with the schedules and / or specifications pending prior approval.
C. For products specified, noted or scheduled stating "or equivalent", "or equal" or similar wording, submit a request for proposed substitutions for any product or manufacturer which is not specifically named for review and approval by the Engineer.
D. For products specified by naming only one manufacturer product, the Engineer may approve a product of equal or greater quality or performance. Submittal must be received 10 days prior to project bid date accompanied with a one – to – one comparison letter.

1.17 Substitution Submissions:

A. Each substitution submittal request shall be accompanied with:
   1. Comprehensive data proving compliance of proposed substitution with requirements stated in the contract documents:
      a) Product identification.
      b) Manufacturer's literature shall identify:
         (1) Manufacturer's name and supporting address, phone number, point of contact and email address.
         (2) Product description.
         (3) Reference standards.
         (4) Performance and test data.

(5) Warranty information of all components.

c) Two projects of similar size and scope on which product has been used, and date of each installation.

d) Itemized comparison of the proposed substitution with product specified listing any variations.

e) Changes in construction schedule.

f) Any effect of substitution on other contracts.

g) List of changes required in any other work, products or required to be made by other Trades.

h) Designation of availability of maintenance services, sources of replacement materials.

B. Substitutions will not be considered for acceptance when:

1. Substitution will require substantial revision of contract documents.
2. They are indicated or implied on shop drawings or product data submittals without a formal request from Contractor or Supplier prior to bid.
3. Information is deemed inadequate by the Engineer necessary for complete evaluation.

1.18 Contractor's Substitution Responsibilities:

A. Contractor affirms that:

1. Contractor has determined that the substitution is equivalent to or superior in all respects to that specified.
2. Contractor will provide the same warranties and or bonds for substitution as for product specified.
3. Contractor will coordinate installation of accepted substitution into the work, and will make such changes as required for the work to be complete in all respects.
4. Contractor waives claims for additional costs caused by substitution which may subsequently become apparent.

B. The Contractor shall have included all costs associated with the substitution for the specified products or materials, and that no additional cost will be incurred by any other party in order to fully incorporate the substituted item(s).

C. The Contractor agrees to reimburse the Architect/Engineer for any architectural or engineering re-design that is required by the substitution to be fully incorporated. The reimbursement shall be at the Architect/Engineer’s standard billing rate.

1.19 Engineer's Duties:

A. Review Contractor's requests for substitutions with reasonable promptness.

B. Notify Contractor in writing of decision to accept or reject requested substitution.

1.20 Observations of Work:

A. The Contractor shall schedule an observation, performed by the Engineer and AHJ, one week in advance of the observation, prior to any Work being concealed, covered, etc.

B. If the Contractor schedules an observation and the Work is found not ready by the Engineer, the Contractor shall reimburse the Engineer, at the Engineer’s standard hourly rate, including travel time, for a re-observation.

C. A copy of the AHJ’s report for any work observed or inspected by the AHJ shall be submitted to the Architect and Engineer.

1.21 Finishing:

A. General: Prior to acceptance of the installation and final payment of the Contract, the Contractor shall perform the work outlined in the Contract Documents.
B. Cleaning: At the conclusion of the construction, all portions of the project work shall be cleaned thoroughly of all debris and unused materials remaining from construction.
C. Equipment, piping and duct systems shall be cleaned internally. The Contractor shall open all dirt legs and remove strainers / filters, completely blowing down as required and clean strainer screens of all accumulated debris. Finished strainers, sized by the manufacturer shall be installed in place of startup strainers, filters, etc.
D. All tanks, fixtures, and pumps shall be drained and proven free of sludge and accumulated matter.
E. All temporary labels, stickers, etc., shall be removed from all fixtures and equipment. (Do not remove permanent name plates, equipment model numbers, ratings, etc.). Painting over equipment nameplates will not be allowed. Nameplates will be replaced with new if damaged or painted over. All equipment shall have affixed adjacent to the permanent nameplate, the unit identification on an engraved label with permanent adhesive or pop-rivet(s).
F. Plumbing fixtures, equipment, tanks, pumps, etc., shall be thoroughly cleaned externally as well.

1.22 Test and Demonstrations:
A. Systems shall be tested and placed in proper working order prior to demonstrating systems to Owner.
B. Prior to acceptance of the mechanical installation, demonstrate to the Owner or designated representatives all essential features and functions of all systems installed, and instruct the Owner in the proper operation and maintenance of such systems. The contract shall allow for five working days and all required tools, devices, etc. to perform the demonstrations / instructions.
C. Provide necessary trained personnel to perform the demonstrations and instructions. Provide manufacturer's representatives for systems as required to assist with the demonstrations.
D. Dates and times for performing the demonstrations shall be coordinated with the Owner.
E. Upon completion of demonstrations, provide a certificate testifying that demonstrations have been completed. Certificate shall list each system demonstrated, dates demonstrations were performed, names of parties in attendance, and shall bear signatures of the Contractor and Owner.

1.23 Painting and Identification:
A. Touch-up paint where equipment has sustained "minor" damage shall be applied with factory provided paint and finish, to match original finish. Damaged shall only be deemed "minor" by the Engineer’s assessment.
B. Provide engraved, laminated plastic tags for all equipment. Tags shall be attached with permanent adhesive or pop-rivet(s).

1.24 Excavating, Trenching, and Backfilling:
A. Provide excavation necessary for underground piping, etc. Backfill trenches and excavations after work has been installed, tested and approved. Care shall be taken in excavating, that walls and footings and adjacent load bearing soils are not disturbed, except where lines must cross under a wall footing. Where a line must

pass under footing, the crossing shall be made by the smallest possible trench to accommodate the pipe. Excavation shall be kept free form water by pumping if necessary. Any open trench shall be protected with signage, fencing, etc. Trenches shall be excavated in accordance with all regulatory Codes and AHJ requirements.

B. Trenches for piping and utilities located inside foundation walls and five (5) feet outside of the exterior wall shall be not less than sixteen (16) inches or more than twenty-four (24) inches wider than the outside diameter of the pipe to be laid. The widths of trenches for piping and utilities located more than five (5) feet outside of building foundation walls, other than for sewers, shall be governed by conditions found at the site.
C. Bottoms of trenches shall be so shaped that when pipe is in place the lower fourth of the circumference for the full length of the pipe will be supported on compacted fill. Fitting holes shall be dug so that no part of the weight of the pipe is supported by the fitting but shall be no larger than necessary for proper jointing. All sewers and piping required for the structure shall be excavated to at least (6) inches below pipe invert.
D. Immediately after testing and/or inspection, the trench shall be carefully backfilled with earth free from clods, brick, etc., to a depth one-half the pipe diameter and then firmly tamped in such a manner as not to disturb the alignment or joints of the pipe. Thereafter, the backfill shall be tamped every vertical foot.

1.25 Concrete Work:

A. Provide concrete bases and housekeeping pads for mechanical equipment unless indicated otherwise. Concrete work shall be as specified in the applicable Civil/Site and Structural Sections. Vibration pads, equipment bases, pipe supports and thrust blocks shall be provided by this Contractor.
B. Provide equipment anchor bolts and coordinate their proper installation and accurate location.

1.26 Access Panels:

A. Access Panel shall be of appropriate size to allow for full service and removal of device behind the access panel.
B. Provide access panels where required and not shown on the drawings for installation by the drywall or masonry Contractor. Access panels shall be steel, primed ready for paint. All access panel locations shall be approved by the Architect/Engineer.
C. Provide fire rated access panels in rated walls, ceilings and floors. Rates shall be in compliance to the assemblies rating. This Contractor shall review Life Safety Drawings for required locations of fire rated access panels.

1.27 Sleeves:

A. Sleeves passing through non-load bearing or non-fire rated walls and partitions shall be Schedule 40 PVC pipe or cast iron pipe.
B. Sleeves passing through load bearing walls, concrete beams, foundations, footings, and waterproof floors shall be Schedule 40 galvanized steel pipe. Sleeve diameter shall be a minimum of 2 pipe sizes larger than pipe being protected.
C. Sleeves for insulated piping shall be of sufficient internal diameter to take pipe and insulation and to allow for free movement of pipe. Sleeve diameter shall be a minimum of 2 pipe sizes larger than pipe being protected. Waterproof sleeves shall be of sufficient internal diameter to take pipe and waterproofing material.

D. In finished areas where pipes are exposed, sleeves shall be terminated flush with wall, partitions, and ceilings, and shall extend 1/2" above finished floors. Extend sleeves 1" above finished floors in areas likely to entrap water.

1.28 Escutcheons:

A. Provide chrome plated escutcheons at each sleeved opening into finished and exposed exterior spaces. Escutcheons shall fit around insulation or around pipe when not insulated; outside diameter shall cover sleeve. Where sleeve extends above finished floor, escutcheon shall clear sleeve extension. Secure escutcheons to sleeve with set screws or other approved devices.

1.29 Insulation Protection:

A. Where exposed insulated piping extends to floor, provide aluminum wrap guard around insulation. Aluminum wrap and straps shall be trimmed to eliminate sharp cutting edges.

1.30 Anchoring of Equipment:

A. All equipment located on floor slab that is capable of being moved shall be secured to the floor with anchor bolts. A minimum of two bolts are required per each piece of equipment and bolts shall be of sufficiently size to prevent equipment from overturning.

B. Roof mounted equipment and curb shall be secured to the roof structure in compliance to ICC wind loading provisions.

1.31 Protection of Electrical Equipment:

A. Water piping shall not be installed in electrical rooms, unless it serves the room and meets the AHJ’s requirements, or directly above electrical equipment.

1.32 Connections for Fixtures and Equipment Under Another Section or By Owner:

A. Rough all equipment requiring connection to systems provided under this Division. Verify requirements and current locations before proceeding with work.

B. Make all connections to equipment furnished under another Section or by the Owner as required to obtain complete and working systems.

1.33 System Guarantee:

A. Work required under this Division shall include a minimum one-year guarantee. Guarantee by Contractor to Owner to replace any defective workmanship or material which has been furnished under this contract at no cost to the Owner, Architect or Engineer for a period of one year, or long if so specified in other sections, from date of Substantial Completion. Guarantee shall also include all reasonable adjustments to system required for proper operation during guarantee period. Guarantee shall not include normal preventative maintenance services or filters.

PART 2 — PRODUCTS

NOT APPLICABLE

PART 3 — EXECUTION

NOT APPLICABLE

END OF SECTION 23 05 00

SECTION 23 05 32 — SUPPORTS AND ANCHORS

PART 1 — 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: Provide all materials, labor, administration and services required for complete installation of all supports and anchors indicated on Drawings and specified within this section.
- A. Ductwork, piping, equipment hangers, supports and required anchors.
- B. Equipment bases, frames and supports.
- C. Flashing and sealing equipment and pipe penetrations.
- D. Sleeves and seals.

1.3 References:
- A. American Society of Mechanical Engineers (ASME)
- B. American Society of Testing and Materials (ASTM)
- C. National Fire Protection Association (NFPA)

1.4 Work Furnished, Installed Under Other Sections:
- A. Furnish hangers and sleeve inserts for placement into formwork, framework, structure, slab, etc.

1.5 Submittals:
- A. Submit shop drawings and product data for all items listed under this section.
- B. Indicate hanger / support framing and attachment methods.
- C. Provide hanger / support framing loading limits, location and load of each hanger / support frame.

1.6 Site Condition:
- A. Do not drill, cut, burn or weld structural members in connection with the installation of pipe supports, bracing and anchorage devices, unless proposed in writing and approved in writing by the Engineer.

PART 2 — PRODUCTS

2.1 Pipe Sleeves:
- A. Sleeves Through Interior Walls, Floors and Ceilings:
  1. Sleeves through Non-Fire Rated floors: Schedule 40 PVC pipe.
  2. Sleeves through Non-Fire Rated walls, footings, and foundation walls: Schedule 40 PVC 2 pipe sizes larger than service pipe.
  3. Sleeves through beams shall be only in locations and of construction approved by the Structural Engineer.

4. Sleeves for floor or wall penetrations at rated assemblies shall conform to Specifications Section 23 05 60.

B. Sleeves Through Exterior Below Grade Walls, Floors and Ceilings:
   1. Schedule 40 Bitumen Coated Steel 2 pipe sizes larger than service pipe.

C. Sleeves Through Exterior Above Grade Walls:
   1. Schedule 40 Bitumen Coated Steel 2 pipe sizes larger than service pipe. Sleeve shall extend 1/8" past finished interior and exterior of wall assembly and painted to match finished wall. Sleeve shall be sealed weather tight.

D. Escutcheons:
   1. Public Areas: Solid plate stainless steel with satin finish.
   2. Non-Public Areas: Split ring chrome plated with set screws.
   3. Size: Minimum one inch annulus shall be provided except at building seismic joints. Building seismic joint pipe sleeves shall be minimum of 5 inches greater than the nominal diameter of the pipe.

2.2 Duct Sleeves:

A. Exterior Insulated Ductwork: Galvanized steel. Parameter shall be large enough to allow for specified insulation to remain continuous through the penetration. Wall shall be sealed tight to ductwork sleeve by General Works Contractor installing wall assembly.

B. Double Wall Spiral / Internally Insulated Ductwork: Galvanized paint grip steel. Wall shall be sealed tight to ductwork sleeve by General Works Contractor installing wall assembly.

C. Sleeves for floor or wall penetrations at rated assemblies shall conform to Specifications Section 23 05 60.

2.3 Fabrication:

A. Size pipe sleeves large enough to allow for movement due to expansion and contraction and continuous insulation.

2.4 Flashing:

A. Metal Flashing: paint grip galvanized steel.

B. Lead Flashing: 5 lb/ft^2 sheet lead for waterproofing.

C. Caps: 20 gauge minimum galvanized steel; minimum 16 gauge at fire resistant elements or as required per assembly rating. Caps shall be paint grip when exposed.

2.5 Pipe Hangers and Supports:

A. Provide pipe hangers, supports and guides hot-dip galvanized unless otherwise indicated. Provide copper-plated hangers on un-insulated copper pipes.

B. Hangers and support components shall be factory fabricated materials designed.
   1. Components shall have hot dipped galvanized coating; electroplate is not acceptable.
   2. Strap type hangers shall not be used on any piping system; use only clevis type. The clevis hanger fastener nuts shall be nylon lock type.

C. Anchors for pipe hanger and supports shall be either of the following types as applicable to installation condition:
   1. Galvanized metal inserts cast into concrete at time of placing.
   2. Anchor bolts for floor mounted equipment may be of a type to be placed in drilled holes and set in place with high strength cement grout.

3. Wedge type, type 316 stainless steel, expansion bolts, anchor bolts set in drilled holes in accordance with manufacturer's instructions. Use of drop-in anchors are prohibited.

2.6 Types of Hangers:
A. Hangers for Cold Pipe: Carbon steel, adjustable clevis.
B. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable clevis.
C. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll clevis.
D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
E. Vertical Support: Steel riser clamp.
F. Copper Pipe: Carbon steel rings, adjustable, copper plated.
G. Hanger Rods: Mild steel continuous threaded.
H. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms. Size inserts to suit threaded hanger rods.

2.7 Anchors and Anchorage Devices:
A. Anchors and Bolts: Bolts and studs, nuts and washers shall be Type 316 stainless steel.
B. Fasteners and Accessories: Provide anchors and fasteners, washers, straps and accessories required for a complete and finished installation. Fasteners shall be Type 316 stainless steel.
C. Expansion Bolts: Where anchors are not included in the concrete or masonry construction, anchors shall be Type 316 stainless steel screws or bolts with expansion-shield type concrete or masonry anchors, of sizes and types indicated or required.

2.8 Finish:
A. Concealed: Provide rust inhibiting primer coat to all support, hanger, anchor, etc.
B. Exposed: Provide rust inhibiting primer coat and two finish coats, color to be selected during the submittal phase, to all support, hanger, anchor, etc.

PART 3 — EXECUTION

3.1 Pipe Hangers and Supports:
A. Support horizontal piping as follows:

Pipe Size	Maximum Hanger Spacing	Hanger Diameter
1/2" – 1-1/4"	6'-6"	3/8"
1-1/2" – 2"	10'-0"	3/8"
2-1/2" – 3"	10'-0"	1/2"
4" – 6"	10'-0"	5/8"
PVC (all)	6'-0"	3/8"
Cast Iron (all)	5'-0"	5/8"

B. Install hangers to provide minimum 1/2" space between finished covering and adjacent work.
C. Place a hanger within 12" of each elbow.
D. Use hangers with 1-1/2" minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub.
F. Support vertical piping at every floor or every 10 feet whichever is more frequent.
G. Support riser piping independently of connected horizontal piping.
H. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
I. All hangers, hanger rods, supports, etc. shall be double-nutted.

3.2 Equipment Bases and Supports:
A. Provide equipment bases of concrete type, minimum 4" thick A.F.F.
B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
C. Construct support of steel members. Brace and fasten with flanges bolted to structure.
D. Provide rigid anchors for pipes after vibration isolation components are installed in accordance with the vibration isolation manufacturer's requirements.

3.3 Flashing:
A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

3.4 Sleeves:
A. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.
B. Install escutcheons as described above.

END OF SECTION 23 05 32

SECTION 23 05 53 — MECHANICAL IDENTIFICATION

PART 1 — 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: Provide all materials, labor, administration and services required for complete installation of all mechanical identification indicated on Drawings and specified within this section.
- A. Identification of equipment, piping and ductwork.
- B. Identification and painting of exposed mechanical piping.
- C. Identification and painting of accessible, concealed mechanical piping.

1.3 Submittals:
- A. Submit samples and manufacturer's installation instructions for mechanical identification products.
- B. Submit valve chart and schedule including valve tag number, size, function, location and valve manufacturer's name and model number.
- C. Submit manufacturer's application instructions and color samples for paint products.

PART 2 — PRODUCTS

2.1 Materials:
- A. Nameplates: Laminated three-layer plastic with engraved white letters on black background color.
- B. Metal Tags: Brass with 1/2 inch high black filled numbers and/or letters, minimum 1-1/2 inch diameter, brass link chain and hooks.
- C. Engraved Metal Tack Markers shall be provide and pop riveted to the Tee Bar main for use of identifying valve locations above acoustical tile ceilings. Color to be selected by submittal. Markers shall be numbered with standard 3/16" characters.
- D. Paint: Gloss enamel.
- E. Stencil Paint: Semi-gloss enamel.
- F. Pipe Markers: Equal to Seton Snap Around Pipe Markers. Acrylic plastic with UV inhibitors. Markers shall indicate direction of flow. Legends shall be alternately reversed and repeated for viewing from any angle. Markers shall be factory formed for the installed diameter. Color-coded background, color of legend letter size and length of color field shall conform completely to the latest edition of ANSI A13.1. Legends shall be alternately reversed and repeated for viewing from any angle.

PART 3 — EXECUTION

3.1 General:
- A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with paint manufacturer's requirements.
C. Plastic nameplates shall be installed with corrosion resistant mechanical fasteners.
D. Metal tags shall be installed with corrosion resistant chain.
E. Engraved metal markers should be identified and located on as-built drawings.
F. Stenciling shall produce neat, high contrast markings. Sizes of markings shall be per the following schedule:

Insulation or Pipe Size	Length of Stencil	Marking Size
3/4" - 1-1/4"	8"	1/2"
1-1/2" - 2	8"	3/4"
2-1/2" - 6"	12"	1-1/4"
8" - 10"	24"	2-1/2"
Over 10"	32"	3-1/2"
Ductwork and Equipment	-	2-1/2"

3.2 Piping:

A. Piping shall be identified at maximum 20 feet on center, at each side of each wall penetration, at each valve and at each connection to equipment. Piping identification shall include type of service, pipe size and direction of flow.
B. Exposed mechanical piping shall be painted with gloss enamel paint and identified per the following schedule:

Type of Service	**Mark**	**Marker / Letter Color**	**Exposed Piping / Lettering Color**
WSHP Loop Water Supply	WSHP LWS	Green / White	Green / White
WSHP Loop Water Return	WSHP LWR	Green / White	Green / White
Chilled Water Supply	CHWS	Blue / White	Blue / White
Chilled Water Return	CHWR	Blue / White	Dark Blue / White
Condenser Water Supply	CWS	Green / White	Green / White
Condenser Water Return	CWR	Green / White	Green / White
Heating Water Supply	HWS	Red / White	Red / White
Heating Water Return	HWR	Red / White	Light Red / White
Hydronic Make-Up Water	HMUW	Brown / White	Brown / White
Evaporator Condensate	CD	Light Blue / White	Purple / White
Refrigerant Lines	FREON	Green / White	White / Black
Reheat Condenser Water Supply	RHCWS	Orange / White	Dark Orange / White
Reheat Condenser Water Return	RHCWR	Orange / White	Light Orange / White
High Pressure Steam	HPS	Blue / White	Blue / White
Low Pressure Steam	LPS	Blue / White	Blue / White
Condensate Return (Gravity)	CDR	Blue / White	Blue / White
Pumped Condensate Return	PCDR	Blue / White	Blue / White
High Pressure Condensate	HPC	Blue / White	Blue / White
Low Pressure Condensate	LPC	Blue / White	Blue / White
Compressed Air	CA - XXX PSI	Red / White	Red / White
Industrial Cold Water	ICW	Brown / White	Light Brown / White
Industrial Hot Water	IHW	Brown / White	Dark Brown / White
Natural Gas	NAT GAS – XXX PSI	Yellow / Black	Yellow / Black
Liquid Petroleum Gas	LP GAS – XXX PSI	Yellow / Black	Yellow / Black
Chemical Fume Hood Exhaust	CFHE	Purple / White	Purple / White

Note: Piping exposed in finished rooms shall be painted per the direction of the Architect / Owner.

C. Concealed mechanical piping shall be identified with stenciled painting or snap around pipe markers.
D. Refrigerant lines shall be labeled using snap around pipe markers.

3.3 Valves:
A. Valves in main and branch piping shall be identified with metal tags.
B. Provide valve chart and schedule, framed with clear plastic shield. Install at location as directed.
C. All valve locations shall be indicated on "As-Built" Drawings.

3.4 Air Bleeds:
A. Provide air bleed chart and schedule, framed with clear plastic shield. Install at location as directed.
B. All air bleed locations shall be indicated on "As-Built" Drawings.

3.5 Ductwork:
A. Ductwork shall be identified with stenciled painting. Identify as to unit number, and area served.

3.6 Equipment:
A. 2,000 MBH and less boilers, base mounted pumps, fans, etc., shall be identified with plastic laminated plates. Large equipment such as fluid coolers, cooling towers, chillers, horsepower rated boilers shall be identified with stenciled painting.
B. Roof top equipment, air handling units, fans, etc., shall be identified using plastic nameplates.
C. Small equipment such as in-line pumps shall be identified with metal tags.
D. Starters for mechanical equipment shall be labeled with the corresponding equipment designation using plastic nameplates
E. Control panels, gauges, instruments and major control components not located at control panels shall be identified with plastic nameplates.

END OF SECTION 23 05 53

SECTION 23 05 60 — THROUGH PENETRATION FIRE STOPPING

PART 1 — 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: Provide all materials, labor, administration and services required for complete installation of all through penetration fire stopping indicated on Drawings and specified within this section.

A. Provide fire stopping for the following through penetrations:
   1. Hydronic piping.
   2. Gas piping.
   3. Pneumatic piping.
   4. Refrigerant piping.
   5. Conduit for wiring and controls.

1.3 References:

A. Underwriters Laboratories (UL).
B. American Society for Testing and Materials (ASTM).

1.4 Contractor Requirements:

A. The contractor shall have at least 5 years experience with through penetration fire stopping systems and shall have completed a least 2 comparable scale projects using these systems.
B. Provide statement from manufacturer that installer has been trained in the proper method of installing fire stop systems.

1.5 Project Conditions:

A. Contractor shall review all Drawings and, when applicable, visit the job site prior to bid to verify wall and floor types to be penetrated. Fire ratings of walls are indicated on the Architectural Drawings.
B. Contractor shall coordinate with all Trades for any penetrating items that have to be routed differently than shown on the plans. Contractor shall provide fire stopping for all rerouted items whether different UL approved systems or additional materials are required.

1.6 Submittals:

A. Shop Drawings:
   1. Provide detailed drawings with installation instruction, indicating any required accessories, per assembly penetration.
   2. Each system must indicate the UL approval for the particular penetration.
   3. Provide detailed specification of construction and fabrication installation instructions.
   4. Provide system performance and technical data.

5. For each non-standard application, provide a manufacturer's qualified engineering judgment and drawing.
6. All UL approved systems shall be selected based on their rating. All systems shall provide the same ratings as the rating of the penetration, as shown on the plans.

B. Warranty:
1. Submit copies of written manufacturer's warranty agreeing to repair or replace work due to a lack of general durability or the appearance of deterioration in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The warranty period shall be one year from date of substantial completion.

1.7 Storage:
A. Store and protect materials in a manner and environment per the manufacturer's requirements.

PART 2 — PRODUCTS

2.1 Through Penetration Fire Stopping:
A. Acceptable manufacturers and products shall be those listed in the UL fire resistance directory for the UL system involved.
B. All systems and devices shall be asbestos free.
C. All fire stopping products shall be from a single manufacturer.

PART 3 — EXECUTION

3.1 General:
A. Verify on site conditions and measurements affecting the work of this Section. Verify that detrimental conditions are corrected before proceeding with installation.
B. Prepare surfaces in accordance with the fire stopping manufacturer's requirements.

3.2 Installation:
A. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's instruction.
B. Provide non-intumescent fire stopping in annular space around fire dampers before installation of damper's retaining angles in accordance with fire damper manufacturer's requirements. Provide non-intumescent fire stopping around the parameter of retaining angles in accordance with fire damper manufacturer's AHJ's requirements.

3.3 Adjusting and Cleaning:
A. Clean any spills of liquid components.
B. Dispose of system materials, debris and components leaving the project area undamaged and in a clean condition.
C. Cut and trim excess materials neatly, flush with adjacent surfaces.

3.4 Field Observation and Quality Control:

A. Contractor is responsible to inspect all penetrations to verify the proper installation of the fire stopping system.
B. Contractor shall leave work accessible for inspection of the Authority Having Jurisdiction.

END OF SECTION 23 05 60

SECTION 23 05 91 — TESTING, ADJUSTING, AND BALANCING

PART 1 — 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: Provide all devices, labor, materials, equipment, administration and services required for all testing, adjusting, and balancing indicated on Drawings and specified herein.

1.3 References:
- A. Associated Air Balance Council (AABC).
- B. National Environmental Balancing Bureau (NEBB).
- C. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
- D. Sheet Metal and Air Conditioning Contractor's Association (SMACNA).

1.4 Contractor's Qualifications:
- A. The T&B Contractor shall be certified by either AABC or NEBB.
- B. The T&B Contractor shall be an independent contractor from the Mechanical Contractor, retained by the Owner.
- C. The qualifications of this Contractor shall be as follows:
  1. Contractor must be a licensed Contractor, specific to this section’s Trade, in the project’s State.
  2. The Contractor shall have been in the testing and balancing contracting business for the last five consecutive years, under their current corporation name with more than 75% of the same corporate officers.
  3. The Contractor shall have completed at least two projects of comparable size and scope within the past two years without receipt of a Notice to Cure.
  4. If Contractor has received a Notice to Cure on any project, that Contractor is excluded from performing work on this project.
  5. The Contractor’s main construction and service office shall be located within 60 driving miles distance of the project site unless approval, 10 days prior to project bid date, has been issued in writing by the Owner, Architect and Engineer.
  6. The Contractor shall provide substantiating proof of these requirements 10 days prior to project bid date. If substantiating proof is not submitted and approved, the Contractor will not be allowed to bid or work the project.
  7. The General Contractor shall not purchase this Contractor’s equipment, materials, etc. All materials, equipment, labor, etc. required to perform the Work herein shall be at the cost of this Contractor.

1.5 Submittals:
- A. Qualifications: Within 30 days of Contractor's Notice to Proceed, submit qualifications of agency and personnel, including a sample copy of the AABC National Performance

Guaranty. If not submitted within the timeframe specified, the Engineer has the right to choose a T&B Contractor at the Contractor's expense.

B. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit T&B strategies and step-by-step procedures as specified in Section 3.2, "Preparation."
C. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, T&B agency shall provide system readiness checklists as specified in Section 3.2, "Preparation," to be used and filled out by the installing contractors verifying that systems are ready for T&B.
D. Examination Report: Provide a summary report of the examination review required in Section 3.1, if issues are discovered that may preclude the proper testing and balancing of the systems.
E. Certified T&B report: Within 10 working days of completion of balancing work, submit AABC or NEBB certified TAB report.

1.6 Quality Assurance:

A. Agency Qualifications: Engage an independent T&B agency certified by AABC or NEBB.
    1. Supervisor: Employee of the T&B agency who is certified by AABC or NEBB as a TBE.
    2. Technician: Employee of the T&B agency who is certified by AABC or NEBB as a TBT.
B. TBE shall perform the following:
    1. Review field data reports to validate accuracy of data and to prepare certified T&B reports.
    2. Certify that the T&B team complied with the approved T&B plan and the procedures referenced in this Specification.
    3. Certify the T&B report.
C. TAB Report Forms: Use approved forms submitted with the Strategies and Procedures Plan.
D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in the AABC National Standards for Total System Balance.

1.7 Contractor Responsibilities:

A. Provide T&B agency one complete set of contract documents, change orders, and approved submittals in digital and hard copy formats.
B. Controls contractor shall provide required BAS hardware, software, personnel and assistance to T&B agency as required to balance the systems. Controls contractor shall also provide trending report to demonstrate that systems are complete.
C. Coordinate meetings and assistance from suppliers and contractors as required by T&B agency.
D. Provide additional valves, dampers, sheaves and belts as required by T&B agency.
E. Flag all manual volume dampers with fluorescent or other high-visibility tape.
F. Provide access to all dampers, valves, test ports, nameplates and other appurtenances as required by T&B agency.
G. Replace or repair insulation as required by T&B agency.
H. Have the HVAC systems at complete operational readiness for T&B to begin. As a minimum, verify the following:
    1. Airside:
        a) All ductwork is complete with all terminals installed.

b) All volume, smoke and fire dampers are open and functional.
c) Clean filters are installed.
d) All fans are operating, free of vibration, and rotating in correct direction.
e) VFD start-up is complete and all safeties are verified.
f) System readiness checklists are completed and returned to T&B agency.

2. Hydronics:
a) Piping is complete with all terminals installed.
b) Water treatment is complete.
c) Systems are flushed, filled and air purged.
d) Strainers are pulled and cleaned.
e) Control valves are functioning per the sequence of operation.
f) All shutoff and balance valves have been verified to be 100% open.
g) Pumps are started, and proper rotation is verified.
h) Pump gauge connections are installed directly at the pump inlet and outlet flange or in discharge and suction pipe prior to any valves or strainers.
i) VFD start-up is complete and all safeties have been verified.
j) System readiness checklists are completed and returned to T&B agency.

I. Promptly correct deficiencies identified during T&B.
J. Maintain a construction schedule that allows the T&B agency to complete work prior to occupancy.

PART 2 — PRODUCTS

NOT APPLICABLE

PART 3 — EXECUTION

3.1 Examination:
A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper T&B of systems and equipment.
B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Note the locations of devices that are not accessible for testing and balancing.
C. Examine the approved submittals for HVAC systems and equipment.
D. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas.
E. Examine equipment performance data including fan and pump curves.
F. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, clean permanent filters are installed, and controls are ready for operation.
G. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected, configured by the controls contractor and functioning.
H. Examine strainers to verify that mechanical contractor has replaced startup screens with permanent screens and that all strainers have been cleaned.
I. Examine two-way valves for proper installation and function.

J. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
L. Examine air vents to verify that mechanical contractor has removed all air from all hydronic systems.

3.2 Preparation:
A. Prepare a T&B plan that includes:
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. Prepare system-readiness checklists, as described in the AABC National Standards for Total System Balance, for use by contractors in verifying system readiness for T&B. These shall include, at a minimum:
1. Airside:
a) All ductwork is complete with all terminals installed.
b) All volume, smoke and fire dampers are open and functional.
c) Clean filters are installed.
d) All fans are operating, free of vibration, and rotating in correct direction.
e) VFD start-up is complete and all safeties are verified.
f) Automatic temperature-control systems are operational.
g) Ceilings are installed.
h) Windows and doors are installed.
i) Suitable access to balancing devices and equipment is provided.
2. Hydronics:
a) Piping is complete with all terminals installed.
b) Water treatment is complete.
c) Systems are flushed, filled and air purged.
d) Strainers are pulled and cleaned.
e) Control valves are functioning per the sequence of operation.
f) All shutoff and balance valves have been verified to be 100% open.
g) Pumps are started and proper rotation is verified.
h) Pump gauge connections are installed directly at the pump inlet and outlet flange or in discharge and suction pipe prior to any valves or strainers.
i) VFD start-up is complete and all safeties are verified.
j) Suitable access to balancing devices and equipment is provided.

3.3 General Procedures For Testing And Balancing:
A. Perform testing and balancing on each system according to the procedures contained in the latest version of the AABC National Standards for Total System Balance and in this Section.
B. 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.
C. Air flow balancing shall be done at the individual device, i.e. VAV Box, inlet and run-out manual dampers. Adjusting mass air flow by the Return, Outside or Supply control dampers, i.e. VAV box damper, through a control system setpoint will not be allowed.

D. Hydronic flow balancing shall be done at the individual device balancing valves. Adjusting flow by a control valve through a control system setpoint will not be allowed.
E. Take and report testing and balancing measurements in inch-pound (IP) units.
F. Test and Balance all air and water systems at occupied, unoccupied, minimum and maximum scheduled flow rates, temperatures, etc.

3.4 General Procedures For Balancing Air Systems:
A. Prepare test reports for both fans and outlets. Obtain approved submittals and any manufacturer-recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
B. Prepare a single-line schematic diagram of systems for the purpose of identifying HVAC components.
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. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
F. Verify that motor starters are equipped with properly sized thermal protection.
G. Check condensate drains for proper connections and functioning.
H. Check for proper sealing of air-handling-unit components.

3.5 Procedures For Constant-Volume Air Systems:
A. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
    1. Measure total airflow as follows:
        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 is not possible, measure airflowat 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 connector.
        c) Measure static pressure across each component that makes up the air handling system, including final filters, duct heaters, etc.
        d) Report any artificial loading of filters at the time static pressures are measured.
    3. 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 will occur. 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, sub-main ducts, and major branch ducts to indicated airflows.
    1. Measure airflow of sub-main and branch ducts.
    2. Adjust sub-main and branch duct volume dampers for specified airflow.

3. Re-measure each sub-main 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 airflow at all inlets and outlets.
   3. Adjust each inlet and outlet for specified airflow.
   4. Re-measure each inlet and outlet after all have been adjusted.

D. Verify final system conditions.
   1. Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
   2. Re-measure and confirm total airflow is within design.
   3. Re-measure all final fan operating data, rpms, volts, amps, static profile.
   4. Mark all final settings.
   5. Test system in economizer mode. Verify proper operation and adjust, if necessary. Measure and record all operating data.

3.6 Procedures For Variable-Air-Volume Systems:

A. Adjust the variable-air-volume systems as follows:
   1. Verify that the system static pressure sensor is located 2/3 of the distance down the duct from the fan discharge.
   2. Verify that the system is under static pressure control.
   3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control setpoint so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
   4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:
      a) Adjust controls so that terminal is calling for maximum airflow.
      b) Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
      c) When maximum airflow is correct, balance the air outlets downstream from terminal units.
      d) Adjust controls so that terminal is calling for minimum airflow.
      e) Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
   5. After all terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
      a) Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.
      b) Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
      c) Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
      d) Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
      e) If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

6. 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 any artificial loading of filters at the time static pressures are measured.
7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
   a) Balance the return-air ducts and inlets the same as described for constant-volume air systems.
   b) Verify all terminal units are meeting design airflow under system maximum flow.
8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure setpoint to the most energy-efficient setpoint to maintain the optimum system static pressure. Record setpoint and give to controls contractor.
9. Verify final system conditions as follows:
   a) Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
   b) Re-measure and confirm total airflow is within design.
   c) Re-measure all final fan operating data, rpms, volts, amps, static profile.
   d) Mark all final settings.
   e) Test system in economizer mode. Verify proper operation and adjust, if necessary. Measure and record all operating data.
   f) Verify tracking between supply and return fans.
10. Record final fan-performance data.

3.7 General Procedures For Hydronic Systems:

A. Prepare test reports for pumps, coils and heat exchangers. Obtain approved submittals and any manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger gpms with pump design flow rate.
B. Verify that hydronic systems are ready for testing and balancing:
   1. Check liquid level in expansion tank.
   2. Check that makeup water has adequate pressure to highest vent.
   3. Check that control valves are in their proper positions.
   4. Check that air has been purged from the system.
   5. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
   6. Verify that motor starters are equipped with properly sized thermal protection.

3.8 Procedures For Constant-Flow Hydronic Systems:

A. Adjust pumps to deliver total design gpm.
   1. Measure total water flow.
      a) Position valves for full flow through coils.
      b) Measure flow by main flow meter, if installed.
      c) If main flow meter is not installed determine flow by pump total dynamic head (TDH) or exchanger pressure drop.

2. Measure pump TDH as follows:
   a) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
   b) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
   c) Convert pressure to head and correct for differences in gauge heights.
   d) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
   e) With all valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

B. Adjust flow measuring devices installed in mains and branches to design water flows.
1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

C. Adjust flow measuring devices installed at terminals for each space to design water flows.
1. Measure flow at all terminals.
2. Adjust each terminal to design flow.
3. Re-measure each terminal after all have been adjusted.
4. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
5. Perform temperature tests after all flows have been balanced.

D. For systems with pressure-independent valves at the terminals:
1. Measure differential pressure and verify that it is within manufacturer’s specified range.
2. Perform temperature tests after all flows have been verified.

E. For systems without pressure-independent valves or flow measuring devices at the terminals:
1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after all flows have been verified.

F. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.
2. Re-measure all final pump operating data, TDH, volts, amps, static profile.
3. Mark all final settings.

G. Verify that all memory stops have been set.

3.9 Procedures For Variable-Flow Hydronic Systems:

A. Adjust the variable-flow hydronic system as follows:
1. Verify that the differential pressure (DP) sensor is located per the contract documents.
2. Determine if there is diversity in the system.

B. For systems with no diversity:
1. Follow procedures outlined in section 3.8 for constant-flow hydronic systems.
2. Prior to verifying final system conditions, determine the system DP setpoint.
3. The pump discharge valve shall be used to set total system flow with VFD at 60 Hz and the VFD shall control system with respect to the DP setpoint.

4. Mark all final settings and verify that all memory stops have been set.

C. For systems with diversity:
   1. Determine diversity factor.
   2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
   3. Follow procedures outlined in section 3.8 for constant flow hydronic systems.
   4. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance the terminals that were just opened.
   5. Prior to verifying final system conditions, determine the system DP setpoint.
   6. The pump discharge valve shall be used to set total system flow with VFD at 60 Hz and the VFD shall control system with respect to the DP setpoint.
   7. Mark all final settings and verify that all memory stops have been set.

3.10 General Procedures For Electric Heat Systems:

A. Prepare test reports for electric duct, VAV and / or unit heaters. Obtain approved submittals and any manufacturer-recommended testing procedures.

B. Verify that electric heat systems are ready for testing and balancing:
   1. Check air flow proving switch.
   2. Check heater kW, voltage and amp draw.
   3. Check that control dampers are in their proper positions for heating CFM.
   4. Check safety limits and controls.
   5. Check entering and leaving temperatures.
   6. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
   7. Verify that motor starters are equipped with properly sized thermal protection.

3.11 Tolerances:

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans: Plus or minus 10 percent.
   2. Air Outlets and Inlets: Plus or minus 10 percent.
   3. Minimum Outside Air: Zero to plus 10 percent.
   4. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.
   5. Heating-Water Flow Rate: Plus or minus 10 percent.
   6. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.12 Final Test & Balance Report:

A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding, and any deviations found during the T&B process. The final report also provides a reference of actual operating conditions for the owner and/or operations personnel. All measurements and test results that appear in the reports must be made on site and dated by the AABC technicians or test and balance engineers.

B. The report must be organized by systems and shall include the following information as a minimum:
   1. Title Page:
      a) Company Name
      b) Company Address
      c) Company Telephone Number

d) Project Identification Number
e) Location
f) Project Architect
g) Project Engineer
h) Project Contractor
i) Project Number
j) Date of Report
k) AABC Certification Statement
l) Name, Signature, and Certification Number of AABC TBE

2. Table of Contents:
3. AABC National Performance Guaranty
4. Report Summary
   (1) The summary shall include a list of items that do not meet design tolerances, with information that may be considered in resolving deficiencies.
5. Instrument List
   a) Type
   b) Manufacturer
   c) Model
   d) Serial Number
   e) Calibration Date
6. T&B Data
   a) Provide test data for specific systems and equipment as required by the most recent edition of the AABC National Standards.

C. One copy of the final test and balance report shall be sent directly to the engineer of record. Provide five (5) additional copies to the contractor.

END OF SECTION 23 05 91

SECTION 23 07 10 — DUCTWORK INSULATION

PART 1 — 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. Perform all Work required to provide and install ductwork insulation and jackets indicated by the Contract Documents with supplementary items necessary for proper installation.

1.3 Reference Standards:

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

D. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

1. ASTM C168 - Terminology Relating to Thermal Insulation Materials.
2. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
3. ASTM C553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
4. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
5. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
6. ASTM C1104 - Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
7. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
8. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
9. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
10. ASTM E84 - Surface Burning Characteristics of Building Materials.
11. ASTM E96 - Water Vapor Transmission of Materials.
12. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
13. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
14. NFPA 255 - Surface Burning Characteristics of Building Materials.
15. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
16. UL 181- Standard for Factory-Made Air Ducts and Air Connectors.
17. UL 723 - Surface Burning Characteristics of Building Materials.

18. ASTM E2336 - Standard for Grease Ducts.
19. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

1.4 Quality Assurance:

A. All ductwork requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

B. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications. No material may be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

C. Application Contractor Qualifications: Contractor performing the Work of this Section must have minimum five (5) years experience specializing in the trade. Insulation Contractor must be separate from the Mechanical Contractor.

D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

E. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, or sloppy Work will not be acceptable.

1.5 Submittals:

A. Product Data:
   1. Provide product description, list of materials, "k" value, "R" value, mean temperature range, and thickness for each service and location.

B. Operation and Maintenance Data:
   1. Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type.
   2. Manufacturer's Installation Instructions: Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.6 Delivery, Storage And Handling:

A. Deliver, store, protect, and handle products to the Project Site under provisions of Division 01.

B. Deliver materials to Site in original factory packaging, labeled with manufacturer's identification including product thermal ratings and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

D. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 — PRODUCTS

2.1 General:

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 Manufacturers:

A. CertainTeed Corporation.
B. Johns Manville Corporation.
C. Knauf Corporation.
D. Owens-Corning.
E. Armacell North America.
F. Unifrax 1 LLC. (FyreWrap)
G. 3M Fire Protection Products (Fire Barrier Duct Wrap 615+)

2.3 Insulation Materials:

A. Type D1: Flexible glass fiber; ASTM C553 and ASTM C1290; commercial grade; 'k' value of 0.25 at 75°F; 1.5 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.
B. Type D2: Rigid glass fiber; ASTM C612, Class 1; 'k' value of 0.23 at 75°F; 3.0 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.
C. Type D3: Ductliner (ONLY to be used when indicated on the Drawings), Closed Cell Flexible Elastomeric Insulation equal to AP Armaflex; 1 inch thick material that has a service temperature range from –297°F to 220°F. This outdoor duct insulation meets ASTM C 534 and shall have minimum ‘k’ value of 0.25 Btu-in. / hr-ft2- °F at minimum density measurement at 75°F. The insulation shall be resistant to mold growth, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.
D. Type D4: Fire Rated Grease Duct Insulation (High Temperature Flexible Blanket); 1-1/2-inch thick refractory grade fibrous fire barrier material with minimum service temperature design of 2,000°F; aluminum foil laminated on both sides; with a minimum ‘k’ value of 0.25 and a minimum density of 6 lbs/cu ft; containing no asbestos. Listed by a nationally recognized testing laboratory (NRTL) UL to meet ASTM E 2336, ASTM E119, and with flame spread/smoke minimum rating of 25 / 50 when tested as per ASTM E84/UL 723.
E. Type D5: Outdoor Duct Insulation (Closed Cell Flexible Elastomeric Insulation); 2 inch thick material that has a service temperature range from –297°F to 220°F. This outdoor duct insulation meets ASTM C 534 and shall have minimum ‘k’ value of 0.25 Btu-in. / hr-ft2- °F at minimum density measurement at 75°F. The insulation and outside surface must be protected with a white Thermo Plastic Rubber Membrane formulated to:
    1. Be resistant to UV, and ozone, acid rain, and physical elements produced from outdoor weather per ASTM E 96 Procedure A.
    2. Have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.
    3. Show no evidence of continued erosion, delaminating, cracking, flaking, or peeling when tested in accordance with the test method for erosion resistance in

UL181. Be resistant to mold growth resistance, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.

2.4 Insulation Accessories:

A. Adhesives: Waterproof vapor barrier type, meeting requirements of ASTM C916; Childers CP-82 or Foster 85-20.
B. Weather Barrier: Breather Mastic: Childers CP-10/CP-11 or Foster 46-50 White..
C. Vapor Barrier Coating: Permeance - ASTM E 96, Procedure B, 0.08 perm or less at 45-mil dry film thickness, tested at 100F and 50%RH; Foster 30-65 or Childers CP-34
    1. When higher humidity levels may be of concern, only specify the following fungus/mold resistant coating: Foster 30-80 AF (anti fungal). Coating must meet ASTM D 5590 with 0 growth rating.
D. Reinforcing Mesh: 10x10 or 9x8 glass mesh; Foster Mast a Fab or Childers #10
E. Jacket: Pre-sized glass cloth, minimum 7.8 oz/sq yd.
F. Type D4 Insulation Adhesive: Fire resistive to ASTM E84, Childers CP-82 or Foster 85-20.
G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.
H. Joint Tape: Glass fiber cloth, open mesh.
I. Tie Wire and Wire Mesh: Annealed steel, 16 gage.
J. Stainless Steel Banding: 3/4-inch wide, minimum 22 gage, 304 stainless.
K. Armaflex 520, 520 BLV, or Foster 85-75 contact adhesive.
L. Armatuff 25 white seal seam tape.

PART 3 — EXECUTION

3.1 Preparation:

A. Verify that ductwork has been tested before applying insulation materials.
B. Verify that surfaces are clean, foreign material removed, and dry.
C. Maintain required ambient temperature during and after installation for a minimum period of 24 hours.

3.2 Installation:

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
B. All installation shall be in accordance with manufacturer’s published recommendations.
C. Extend duct insulation without interruption through walls, floors, and similar penetrations, except where otherwise indicated.
D. Provide external insulation on all round ductwork connectors to ceiling diffusers and on top of diffusers as indicated in the Ductwork Insulation Application and Thickness Schedule and the Drawings. Secure insulation to the top of ceiling diffusers with adhesive that meets NFPA 90A and 90B 25/50 requirements, and vapor barrier or tape to match jacket. Do not insulate top of ceiling diffuser if it is used in ceiling return air plenum or in an open space with no ceiling.
E. Flexible and Rigid fiberglass insulation (Types D1 and D2) application for exterior of duct:

1. Secure insulation jacket joints with vapor barrier adhesive or tape to match jacket.
2. Install without sag on underside of ductwork. Use 4-inch wide strips of adhesive on 8-inch centers and mechanical fasteners where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
3. Insulate standing seams and stiffeners that protrude through the insulation with 1-1/2 inch thick, unfaced, flexible blanket insulation. Cover with reinforcing mesh and coat with vapor barrier finish coating.
4. On circumferential joints, the 2-inch flange on the facing shall be secured with 9/16 inch outward clinch steel staples on 2-inch centers, and taped with minimum 3-inch wide strip of glass fabric and finish coating.
5. Vapor seal all seams, joints, pin penetrations and other breaks with vapor barrier coating reinforced with reinforcing mesh.

F. Duct Liner (Type D3):
1. Follow the manufacturer's installation requirements including the duct preparation for adhesive.
2. Secure insulation with 100 percent coverage of duct liner manufacturer's adhesive, pins and clips not more than 18 inches on center.
3. Secure bottom of duct insulation using alternate single and double clips. The first pin will secure the insulation and the second clip will be used to secure the cladding. Isolate the exterior clip from the cladding by using two 1/8 inch closed cell neoprene (Armaflex) washers on either side of the cladding. Predrill holes in cladding and avoid contact with pin during installation.
4. For joints and overlaps, fold cladding to form a double thickness hem 2 inches minimum. Seal with a non-shrink, non-hardening sealing compound.

G. Insulation (Type D4) application for exterior of grease ducts:
1. External duct wrap system requires two (2) 1.5-inch layers of lightweight, flexible wrap overlapped to provide an effective fire barrier. The barrier is installed in 24-inch or 48-inch wide sections. Insulation pins are welded in certain locations to maintain the fire barrier material up against the duct.
2. Grease duct doors to be installed so the door can be removed and re installed and meet code requirements.
3. Install duct wrap as tested per manufacturer's instructions to assure the duct wrap is mechanically attached per the manufacturer's spacing of bands or weld pins.
4. Vertical and horizontal members of the support hanger system shall be wrapped with one layer of the insulation. Vertical and horizontal portions shall be wrapped independent of one another. The horizontal hanger shall be removed from the vertical support rods and wrapped and then immediately replaced so that an adjacent horizontal support can be removed, wrapped, and reinstalled. The end of the threaded vertical rod shall extend 6-inch past the horizontal member at the beginning of the installation.
5. Penetrations: Where ducts penetrate fire rated walls, floors and roofs, the duct wrap shall be used in conjunction with a firestop system that is listed by a nationally recognized laboratory and rated for penetration of a rated wall or floor by the fire rated grease duct system used.

H. Insulation (Type D5) application for outdoor ducts:

1. Horizontal ductwork located outdoors shall be sloped at a minimum 2-degree angle to prevent the accumulation of water on top of the finished insulated duct. Support members that connect directly to the ductwork are to be insulated with this same material. Keep compression or sharp creases of outdoor insulation to a minimum by distributing the weight of the duct resting on horizontal duct support members.
2. Follow the insulation manufacturer's installation instructions and procedures to assure the ductwork is properly insulated and that the insulation will meet the manufacturer's warranty requirements.

I. All ductwork, accessories, and all plenums including metal and masonry, gypsum construction, etc., shall be insulated as indicated on the Drawings, as specified herein and as required for a complete system. In each case, the insulation shall be equal to that specified and materials applied and finished as described in these Specifications.

J. Flexible ductwork connections to equipment shall be insulated.

K. Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be sealed. Where insulation with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.

L. Extreme care shall be taken in insulating high and medium pressure ductwork including all ductwork between the fan discharge and all mixing boxes to ensure the duct is not pierced with sheet metal screws or other fasteners. All high and medium pressure ducts in these Specifications are classified as high velocity ductwork.

M. Where canvas finish is specified use lagging adhesive/coating to prevent mildew in securing canvas. Do not use wheat paste. Use only anti fungal lagging adhesive that adheres to ASTM D 5590 with 0 growth rating. (Foster 30-60, Childers CP-137AF). In addition, cover all exterior canvas-covered insulation with a fire retardant weather barrier mastic.

N. Flexible round ducts shall be factory insulated.

3.3 Inspection:

A. Visually inspect the completed insulation installation per manufacturers recommended materials, procedures and repair or replace any improperly sealed joints.

B. Where there is evidence of vapor barrier failure or "wet" insulation after installation, the damaged insulation shall be removed, duct surface shall be cleaned and dried and new insulation shall be installed.

3.4 Ductwork Insulation Application And Thickness Schedule:

Ductwork System	Application	Insulation Type	Insulation Thickness
Supply Air (Hot, Cold, Combination)	Outside of Mechanical Rooms	D1	2"
	Inside of Mechanical Rooms	D2	1-1/2"
Return Air, Relief Air, and Exhaust Air	All	D1	2"
Outside Air	Treated and Untreated	D1	2"

Ductwork System	Application	Insulation Type	Insulation Thickness
Supply, Return and Outside Air	Concealed Outside Building Insulation Envelope (i.e. Attic)	D1	3”
Kitchen Grease Hood Exhaust Air	All	D4	3"
Duct mounted coils	Inside of Mechanical Rooms	D2	2”
Terminal Unit Heating Coils	All	D1	2”
Air Diffusers, Grilles, Registers	Top of Device	D1	2"
Supply Air Duct	Outdoor Environment	D5	2”
Return, Exhaust Air Duct	Outdoor Environment	D5	1-1/2"

END OF SECTION 23 07 10

SECTION 23 07 38 — INSULATION FOR REFRIGERANT PIPING

PART 1 — 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: Provide all materials, labor, administration, equipment and services required for complete installation of all insulation for refrigerant piping indicated on Drawings and specified in this section.

A. Work of this section shall include providing the thermal insulation for mechanical systems and shall include the following principal items:
   1. Refrigerant vapor line on all systems.
   2. Liquid lines where required by the manufacturer.

B. This work shall be performed by an insulation contractor whose primary business is the installation of insulation systems, who has been in this business for a minimum of five years and has successfully completed two projects of similar size and scope.

1.3 Submittals:

A. Submit product literature for each insulation type and finish indicating the equipment served.

B. Provide submittals on method of installation for each type of insulation utilized.

PART 2 — PRODUCTS

2.1 Thermal Insulation:

A. All insulating systems shall be tested on a composite basis in accordance with NFPA and UL 723 and shall have a maximum flame spread rating of 25 and a maximum smoke developed rating of 50 under ASTM E-84.

2.2 Insulation Types:

A. Closed cell, flexible elastomeric thermal insulation, black in color, supplied in unslit tubing. Equal to Armaflex AP 2000.

B. Closed cell, elastomeric thermal insulation tape. Tape shall be manufactured with reinforced fibers equal to Armaflex insulation tape. Tape shall only be used for insulation of small devices.

2.3 Adhesives:

A. Equal to Armstrong 520 adhesive, air drying contact adhesive specifically designed for joining seams and ends of Armaflex AP-2000.

2.4 Finishes:

A. A white, elastomeric, UL classified outdoor grade, vinyl mastic for finished outdoor insulation. Water based latex enamel. Equal to WB Armaflex finish.

PART 3 — EXECUTION

3.1 Workmanship:

A. All materials shall be applied by craftsmen skilled in this trade. Unsightly work shall be cause for rejection.
B. All joints shall be mitered. No exceptions.
C. Materials shall be applied only after systems have been tested and all surfaces are clean and dry.
D. Cellular glass block supports or other suitable non-compressible insulation material equal in thickness to the insulation and four times the pipe diameter in length shall be installed at hangers to eliminate through-metal conductance. Provide 18 gauge, 180°, galvanized sheet metal saddles same length as block supports.

3.2 Application:

A. Insulation shall be butted together and adhered in place with joint adhesive. All joints and seams shall be sealed with contact adhesive. Insulation shall be butted firmly to equipment and adhesive applied. Insulation shall be slipped on without slitting where possible.
B. Paint all exposed insulation with a minimum of two coats of Armaflex white paint.
C. Provide sheet metal saddles for all insulated refrigerant piping at pipe supports.

3.3 Insulation Thickness:

A. Provide 3/4" thick insulation materials for all refrigerant vapor line, liquid line piping and hot gas piping.

END OF SECTION 23 07 38

SECTION 23 07 40 — INSULATION FOR CONDENSATE DRAINS

PART 1 — 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: Provide all materials, labor, administration, equipment and services required for complete installation of all insulation for condensate drains indicated on Drawings and specified in this section.

1.3 Contractor's Qualifications:
A. This work shall be performed by a skilled insulation contractor whose primary business is the installation of insulation systems and who has been in this business for a minimum of 5 years and has successfully completed 2 projects of similar size and scope.

1.4 Submittals:
A. Submit product literature for each insulation type, finish type and equipment served. Provide submittals on method of installation for each type of insulation used.

PART 2 — PRODUCTS

2.1 Thermal Insulation:
A. All insulating systems shall be tested on a composite basis in accordance with NFPA and UL 723 and shall have a maximum flame spread rating of 25 and a maximum smoke developed rating of 50 under ASTM E-84.

2.2 Insulation Types:
A. Closed cell, flexible elastomeric thermal insulation, black in color, supplied in unslit tubing. Equal to Armaflex AP 2000.
B. Closed cell, elastomeric thermal insulation tape. Commonly supplied in 2" x 1/8" thick. Equal to Armaflex insulation tape.

2.3 Adhesives:
A. Equal to Armstrong 520 adhesive, air drying contact adhesive specifically designed for joining seams and ends of Armaflex AP-2000.

2.4 Finishes:
A. A white, elastomeric, UL classified outdoor grade, vinyl mastic for finished outdoor insulation. Water based latex enamel. Equal to WB Armaflex finish.

PART 3 — EXECUTION

3.1 Workmanship:

A. All materials shall be applied by craftsmen skilled in this trade. Unsightly work shall be cause for rejection.
B. All joints shall be mitered. No exceptions.
C. Materials shall be applied only after systems have been tested and all surfaces are clean and dry.
D. Cellular glass block supports or other suitable non-compressible insulation material equal in thickness to the insulation and four times the pipe diameter in length shall be installed at hangers to eliminate through-metal conductance. Provide 18 gauge, 180°, galvanized sheet metal saddles same length as block supports.

3.2 Application:

A. Insulation shall be butted together and adhered in place with joint adhesive. All joints and seams shall be sealed with contact adhesive. Insulation shall be butted firmly to equipment and adhesive applied. Insulation shall be slipped on without slitting where possible.
B. Paint all exposed insulation with a minimum of two coats of Armaflex white paint.
C. Provide sheet metal saddles for all insulated refrigerant piping at pipe supports.

3.3 Insulation Thickness:

A. Provide 1/2" thick insulation materials for all condensate piping.

END OF SECTION 23 07 40

SECTION 23 21 14 — CONDENSATE DRAIN PIPING SYSTEMS

PART 1 — 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: Provide all materials, labor, administration, equipment and services required for complete installation of all condensate drain piping systems indicated on Drawings and specified herein.

1.3 References:
- A. American National Standards Institute (ANSI).
- B. American Society of Mechanical Engineers (ASME).
- C. American Society of Testing and Materials (ASTM).

1.4 Submittals:
- A. Submit manufacturer's catalog data for all materials listed under this section.

PART 2 — PRODUCTS

2.1 Piping:
- A. Condensate drain piping shall be one of the following:
  1. Type L hard drawn copper per ASTM B-88. Fittings are to be wrought copper or cast brass. Joints are to be soldered with lead free, tin-silver solder.
  2. PVC Pipe and Fittings: Schedule 40 per ASTM D-1785 / ASTM D-2466. Joints: Solvent weld per ASTM D-2855 with solvent per ASTM D-2564.

2.2 Overflow Drain Pans:
- A. Contractor shall provide a condensate pan under all equipment capable of producing condensation. An overflow pan shall be provided in the case of furnaces upstream of an evaporator coil. Overflow pans shall extend 2 inches on all sides of a furnace and evaporator coil combination.
- B. Condensate overflow drain pans are to be fabricated from minimum 24 gauge galvanized steel and shall have joints welded water tight. Folded corners will not be allowed. The use of silicone to seal joints will not be allowed.
- C. Drain pan minimum dimensions shall be two inches deep and shall be two inches larger on all sides than the piece of equipment it is under. All drain pans with any dimension greater than 24" shall be cross broken. The top of the pan shall be hemmed on all sides to remove all exposed sharp edges.
- D. All condensate pans shall be equipped with a liquid sensing switch either integrated into the system served and / or building controls system.

PART 3 — EXECUTION

3.1 General:

A. Piping shall be run as directly as possible, avoiding all unnecessary fittings and joints. Changes in routing of piping due to field conditions shall be at the expense of this Contractor. Coordinate with all Trades

B. Piping shall be cut to site specific measurements, worked into place without forcing, located as indicated on the Drawings and supported per piping manufacturer's and Code requirements. Piping shall be supported as high as possible. Piping shall be concealed unless otherwise noted.

C. Provide chrome plated steel escutcheon plates at each exposed piping penetration of walls and ceilings. Escutcheon plates for insulated piping shall be sized for the insulation diameter.

3.2 Condensate Drain Piping:

A. Slope piping at a uniform slope of at least 1/4" inch per foot to ensure proper drainage.

B. Provide a vent on the trap if the discharge height is ten feet or greater.

C. Provide condensate drain trap with a depth at least two inches greater than the fan total static pressure as measured from the invert of unit connection to the discharge invert. Pre-formed traps will be allowed. Provide threaded cleanouts at the top and bottom of the trap.

D. Condensate drain lines shall be adequately supported to prevent low points which could cause double trapping. Piping shall be supported at minimum intervals specified in other sections or per the pipe manufacturer's requirements, whichever is greater.

E. Condensate drain lines indicated to be terminated at floor drains shall either be turned down through / past the floor drain grate or be provided an indirect waste funnel for the floor drain.

3.3 Drain Pans:

A. Drain pans shall be installed under every piece of equipment that produces condensate.

B. Equipment shall be held up off the bottom of the drain pans with rubber in shear isolators. The isolators shall be located above rigid supports beneath the pan. Provide additional supports as needed for required trap depth.

C. All drain pans shall be equipped with a liquid sensing switch either integrated into the system served and / or building controls system.

END OF SECTION 23 21 14

SECTION 23 23 10 — REFRIGERANT PIPING SYSTEMS

PART 1 — 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: Provide all materials, labor, administration, equipment and services required for complete installation of all refrigerant piping systems indicated on Drawings and specified herein.

1.3 References:
- A. American National Standards Institute (ANSI).
- B. American Society of Mechanical Engineers (ASME).
- C. American Society of Testing and Materials (ASTM).

1.4 Submittals:
- A. Submit manufacturer's catalog data for all materials listed under this section.

PART 2 — PRODUCTS

2.1 Piping:
- A. Refrigerant Piping shall be ACR copper tubing Type L hard drawn per ASTM B280 and shall be cleaned, dehydrated, charged with gaseous nitrogen and sealed. Fittings shall be forged or wrought copper.

2.2 Piping Appurtenances:
- A. Filter Driers:
  1. The dryer shall be constructed so that no desiccant will pass into the refrigerant lines.
  2. A filter dryer shall be provided in the liquid line to each evaporator. Pressure drop through the dryer shall not exceed 2 psig when operating at full connected evaporator capacity.
     - a) Filter dryers smaller than 1/2" shall be the hermitically sealed.
     - b) Filter dryers 1/2" and larger shall be the full-flow, replaceable-core type. Cores shall be of a suitable desiccant that will not plug, cake, dust, channel, or break down but shall remove water, acid, and foreign material from the refrigerant. The filter dryer shall be piped with two brass isolation valves
- B. Liquid Sight Glasses: Sight glasses shall be double glass, see-through type, with cover cap(s). Glass shall be furnished with a color-change-type moisture indicator. Sight glass shall be provided in liquid line immediately preceding each expansion valve and any filter dryer.
- C. Shutoff Valves: Shutoff valves shall be brass ball valve, bi-directional, full port. Valve pressure drop shall not exceed 2 psig.

D. Solenoid Valves: Valves shall be brass body, packless type, with corrosion-resistant steel trim, rated for continuous-duty service, direct-or pilot-operated, provided with manual lift stems, and designed for use with type of refrigerant used. The valve capacities shall be sufficient for the requirements of the installation at a pressure drop not in excess of 2 psig.
E. Expansion Valves: Shall be thermal-expansion hard shut off type to suit specific system refrigerant, designed to fit coil distributors, and capable of operating from 40 to 100% of full load at system head pressure without hunting or liquid hammer. Valves shall have external equalizer connections and external superheat adjustments with seal caps. Superheat setting shall be per equipment manufacturer's requirements. Each valve shall be provided with external strainer.

PART 3 — EXECUTION

3.1 General:
A. Piping shall be cut to site measurements. Piping shall be worked into place without forcing. Piping shall be supported as high as possible. Piping shall be concealed unless noted otherwise.
B. Piping shall be run as directly as possible avoiding all unnecessary fittings and joints. Changes in routing of piping due to field conditions shall be at the expense of this Contractor.
C. Provide sleeves for all piping penetrations of floors and walls.
D. Provide chrome plated steel escutcheons at each exposed piping penetration of walls and ceilings.

3.2 Refrigerant Piping Systems:
A. All refrigerant piping shall be ACR Type L hard drawn tubing.
B. All refrigerant lines shall be sized in accordance with the equipment manufacturer's requirements with respect to system capacity and line set length and lift.
C. All elbows in refrigerant piping systems shall be long radius elbows.
D. Joints shall be brazed using a continuous flow of nitrogen inside the piping with a flow regulator.
E. All piping shall be supported.
F. Provide filter driers, sight glasses, moisture indicators, shutoff valves, solenoid valves and expansion valves when not provided as standard or as an option on equipment. Components shall be specifically designed for refrigeration service.
G. Test each piping system at 150 psig using dry nitrogen for 24 hours. Joints that leak shall be removed and replaced with new. Pressure test shall be repeated until all joints pass. Contractor shall graph pressure test and submit a copy of the test to the Engineer.
H. Vacuum test each piping system after pressure test is completed. Piping shall be drawn to 500 microns and tested for 12 hours without additional pumping. If piping system fails, the system shall be retested for leaks and another vacuum pulled on the system as described.
I. Charge each system per manufacturer's requirements.

END OF SECTION 23 23 10

SECTION 23 31 10 — GALVANIZED SHEET METAL DUCTWORK

PART 1 — 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: Provide all material fabrication, labor, administration, equipment and services required for complete installation of all galvanized sheet metal ductwork indicated on Drawings and specified herein.

1.3 References:
- A. American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE).
- B. National Fire Protection Association (NFPA).
- C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
- D. Air Diffusion Council (ADC).
- E. Air Movement and Control Association (AMCA).
- F. Underwriters Laboratories, Inc. (UL).

1.4 Submittals:
- A. Submit catalogue data and shop drawings for all materials and equipment listed under this section.

PART 2 — PRODUCTS

2.1 Fabrication:
- A. All sheet metal ductwork shall be fabricated and installed in accordance SMACNA standards unless more stringent requirements are stated herein.

2.2 Galvanized Sheet Metal Ductwork:
- A. Sheet Metal Ductwork:
  1. Galvanized steel ductwork shall be carbon steel, of lock-forming quality, hot dip galvanized, with regular spangle-type zinc coating, conforming to ASTM A-527/A527M-G90.
  2. Sheet metal gauges and reinforcement shall conform to the latest edition SMACNA HVAC duct construction standards. 26 gauge will be the lightest gauge allowed for all ductwork.
  3. All ductwork, including hangers, drives, flanges, accessories, etc., exposed in occupied areas shall also have a paint grip finish.

2.3 Ductwork Sealant:
- A. Sealant shall be non-flammable when wet, fire resistive when dry, and suitable for use in high velocity ductwork. Shall meet NFPA 90A and 90B and be UL classified.

Sealant shall have a maximum 25 flame spread and 50 smoke developed compound specifically for sealing ductwork.

B. Duct Tape will not be allowed.

2.4 Ductwork Accessories:

A. General: Provide duct accessories as indicated on the drawings and as required for proper system operation and balance.

B. Flexible Duct Connections: Flexible duct connections shall be UL listed fire retardant neoprene coated woven glass fiber fabric connections, shall conform to NFPA 90A and 90B and have a maximum flame spread rating of 25 and a maximum smoke development rating of 50. Flexible duct connectors shall be equal to DuroDyna Neoprene UL classification file # R4462.

C. Manual Balancing Dampers:

1. Dampers in rectangular ductwork shall be equal to shall be Ruskin model CD-60, opposed blade type, complete with concealed linkage and extended shaft for the damper quadrant or motorized operator, 16 gauge frame and double skin airfoil blades with the equivalent thickness of 14 gauge. The axle is to be 1/2" plated hex steel with stainless steel or oil impregnated bearings. Blades shall have neoprene edge seals and compression jamb seals. Dampers listed as 8" x 10" or smaller shall be single blade.
2. Dampers in round ductwork shall be equal to Ruskin model CDRS25, single blade. Blade shall be two layers of galvanized steel with the equivalent thickness of 14 gauge. A neoprene seal shall be sandwiched between the two blades. The damper axle shall be 1/2" diameter and extend 6" beyond the frame for the damper quadrant or motorized operator and shall be installed in stainless steel or oil impregnated bronze bearings.

D. Damper Quadrants: Damper quadrants shall have indicators showing open, incremental and closed positions.

E. Motorized Dampers: Motorized dampers shall be the same as the manual dampers with the addition of a motorized operator, specified as follows:

1. Two Position Motorized dampers shall be controlled with Belimo model NF24-S-US, 24 volt, 60 in-lb torque with 75 second run time, spring return and built in auxiliary switch. Actuators shall be factory mounted to the dampers.
2. Fully Modulating Motorized dampers shall be controlled with Belimo model NF24-SR-S-US, 24 volt, 60 in-lb torque, spring return and built in auxiliary switch. Actuators shall be factory mounted to the dampers.

F. Turning Vanes: All turning vanes shall be single thickness with a 2" radius, installed on runners with 2-1/8" blade spacing. Blades shall be 26 gauge.

G. Adjustable Splitter and Volume Dampers: Rectangular duct mounted splitter dampers and adjustable volume extractors shall be fabricated form 16-gauge steel with a hemmed leading edge. The trailing edge shall be pivoted on a rod or hinges. Install in accordance with the latest edition a SMACNA's Low Velocity Manual and as detailed on the drawings. Secure rod to leading edge of damper and extend rod through side of ductwork using Ventlock 603 ball joint bracket with set screw.

H. Access Doors:

1. Duct Access Doors shall be UL labeled, galvanized steel, double panel construction, internally insulated with minimum 1-inch thick fiberglass insulation complete with gaskets.

a) Rectangular, Low Pressure Duct: Ductmate Industries, 24 gauge with hinged frame connection and cam lock closures. Doors shall be 16”x16” or as large as possible.
b) Rectangular, High Pressure Duct: Ductmate Industries FDHPC, 24 gauge galvanized panel, 22 gauge frame with 16 gauge camlock closures on all sides. Provide safety chain(s).
c) Round, Low and High Pressure Duct: Ductmate Industries, 22 gauge, spiral compression with conical springs and hand knobs.

2. The location of the access doors shall be coordinated for easy access to the fire damper fusible links.

2.5 45 Degree, Square-to-Round Takeoff Fittings:

A. All branch duct takeoffs to a single air distribution device, shall be made using a rectangular, 45 degree takeoff that transitions to the round duct size shown on the plans. Branch ducts from a round main shall be the same as above with the exception that the rectangular portion shall match the curvature of the main.
B. The takeoff shall be fabricated from G-90 galvanized steel, 4” W.G. construction..
C. Takeoff shall have a 1" wide gasketed flange with pre-drilled screw holes.
D. All sizes shall be fabricated with a damper handle insulation standoff.
E. Take off shall be Flexmaster STOD-BO3 for rectangular duct and AirFlow #63RATD-2 for round duct or equal.

2.6 Insulated Flexible Ductwork:

A. Insulated flexible duct shall be listed under UL standard 181 as Class 1 air duct and shall comply with NFPA standards 90A and 90B. The duct shall be 25/50 rated for flame spread/smoke developed.
B. The duct shall be constructed with an acoustically transparent CPE film mechanically locked to a corrosion resistant galvanized steel wire helix.
   1. The duct shall be insulated with a factory applied fiberglass blanket. Insulation R-value for duct shall be R-8.0.
C. The vapor barrier shall be a fire retardant, reinforced, metalized outer jacket with a permeance of 0.05 perm.
D. Flexible ductwork shall be rated for 10 inwg. positive pressure and 5 inwg. negative pressure through 16" diameter. Flexible duct on sizes greater than 16" shall not be used however a flex connector shall be used to separate the sheet metal duct from the unit or grille connection. The rated temperature range shall be –20 to 250°F. The UL rated velocity shall be 6000 fpm.
E. Insulated flexible duct shall be Flexmaster Type 1M.
F. Flex duct shall have a 20 year factory warranty.

2.7 Duct Supports:

A. General:
   1. Duct supports shall be placed within four feet on every side of each branch intersection and within two feet on either side of an elbow.
   2. If spacing of the building structural members is greater than the maximum allowed for duct supports, additional structural members, adequate to support duct and insulation, shall be placed to span the building structural members to provide support for the ducts.
B. Rectangular Ductwork:

1. Rectangular ductwork shall be supported at a maximum of every four (4) feet using a pair of 1" straps fabricated from 20 gage sheet metal or two 3/8" diameter all thread rods. The supports shall be attached to the duct and the building structure in accordance with SMACNA standards. This shall apply to all rectangular ducts up to a maximum half of duct perimeter of 120".
2. For ducts with a half of duct perimeter greater than 120", the gauge of the support straps and size of the rods shall be in accordance with SMACNA standards.

C. Round Ductwork:
1. Round ductwork up to 36" diameter shall be supported at a maximum of every eight (8) feet using a single 1" strap fabricated from 20 gage sheet metal or 3/8" rod. The supports shall be attached to the duct and the building structure in accordance with SMACNA standards.
2. Round ducts greater than 36" diameter, shall be supported by straps or rods sized in accordance with SMACNA standards.

D. Flexible Ductwork:
1. Flexible duct shall be supported by single 1" strap fabricated from 26 gage sheet metal.

PART 3 — EXECUTION

3.1 Galvanized Sheet Metal Ductwork:

A. Sheet Metal Ductwork shall be fabricated and installed per the latest edition of the SMACNA HVAC duct construction standards and the ASHRAE Handbook.

B. All ductwork shall be supported in accordance with SMACNA standards. All threaded rod supports shall be double nutted.

C. Duct transitions shall be fabricated and installed per SMACNA standards and shall not choke flow or reduce the free area of the duct.

D. All rectangular duct elbows shall be fabricated in accordance with either of the following:
1. Radius Elbow: All radius elbows shall have a centerline radius equal to 1.5 times the width of the duct. This results in an inside radius equal to the width of the duct. Under no circumstances will radius elbows with a centerline radius of 0.5 times the duct width and an inside radius of 0.0 (90 degrees angle throat and radius heel) be allowed.
2. Mitered Elbow: All mitered elbows with an angle over 45 degrees shall be provided with turning vanes.

E. All duct sizes shown on plans are net free area. Contractor shall allow for insulation thicknesses.

3.2 Duct Sealant:

A. All duct systems shall be sealed to meet SMACNA Seal Class B. All transverse and longitudinal seams in all ducts shall be sealed.

3.3 Ductwork Accessories:

A. Flexible duct connections shall be installed on all ductwork required to be attached to motor driven equipment.
1. The ends of the flexible connection shall be overlapped and sealed, to prevent air leakage, per the manufacturer’s recommendations.

B. Manual Balancing, Splitter and Quadrant Dampers:
   1. All dampers shall be installed so that damper blades have a full range of movement without interference or binding. Damper quadrant shall be located to provide easy access.
   2. Provide reinforcement to damper as required so that damper remains stable in the airstream without rattling.

C. Turning Vanes:
   1. Turning vanes shall be installed in all mitered elbows with an angle greater than 45 degrees.
   2. The trailing edge of the turning vanes shall be installed tangent to the air stream.
   3. All individual vanes shall be installed on vane rails.

3.4 Rectangular-To-Round Take-Offs:

A. Rectangular-to-round take-offs shall be installed in accurately cut openings in the sheet metal duct work.

B. Rectangular-to-round take-offs shall be sealed for the pressure class required.

C. The quadrant damper shall be checked for free movement and left in the full open position after the take-off and insulation is installed. Test and Balance Contractor shall set final damper position.

3.5 Insulated Flexible Ductwork:

A. The length of flexible duct work shall not exceed 5 feet. For lengths of duct required over 5 feet, the remainder shall be galvanized steel round duct.

B. Flex ducts shall be connected in the following manner:
   1. Flex inner duct shall be duct taped, with standard gray tape, first then duct draw band strap applied.
   2. Flex duct insulation shall be butted to connection over flex inner duct. Duct draw band strap shall be applied then taped over with FSK duct tape.

C. Bends in flexible duct shall be made with not less than 1 duct diameter centerline radius. Extend flexible duct beyond end of sheet metal connection before bending.

END OF SECTION 23 31 10

SECTION 23 34 10 — CEILING AND CABINET FANS

PART 1 — 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: Provide all materials, labor, administration, devices, equipment and services required for complete installation of all ceiling and cabinet fans indicated on Drawings and specified in this section.

1.3 References:
- A. Air Diffusion Council (ADC).
- B. Air Movement and Control Association (AMCA).
- C. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
- D. National Fire Protection Association (NFPA).
- E. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- F. Underwriters Laboratories, Inc. (UL).

1.4 Submittals:
- A. Submit catalog data and shop drawings for all materials and equipment listed under the section.

PART 2 — PRODUCTS

2.1 Ceiling and Cabinet Fans:
- A. Cabinet Mounted Centrifugal Fans shall be UL listed and bear the AMCA Seal for air and sound performance.
- B. Housings shall have an integral backdraft damper, be acoustically insulated, convertible to either horizontal or vertical discharge and equipped with a white powder coated aluminum grille.
- C. Fan wheel shall be direct driven, dynamically balanced, forward curved type. Motors shall have internal thermal overload protection, compatible with speed controllers, mounted on vibration isolators and factory wired with quick connect for easy disconnection for inspection and service.
- D. Fans shall be equipped with mounting brackets readily adapted to various mountings.
- E. The following accessories shall be provided when indicated in the fan schedule:
  1. Vibration Isolation.
  2. Speed Control mounted to fan.
  3. Switch or breaker type lock-out type disconnect.
  4. Deluxe aluminum architectural grille.
- F. Cook is specified to establish quality of equipment.

2.2 General:

A. Provide and install fans and accessories as scheduled on the Drawings and specified in this Section.
B. Fan air performance ratings shall be in accordance with AMCA Standard 210.
C. Fan sound performance ratings shall be in accordance with AMCA Standard 300 and shall not exceed specified level at specified air delivery conditions.
D. Provide fans capable of accommodating static pressure variations of plus or minus 10 percent.
E. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas of the building.

PART 3 — EXECUTION

3.1 Ceiling and Cabinet Fans:

A. Set and install fans as specified and indicated on the drawings and per manufacturer's requirements.
B. Equipment installation shall be such that filters, motors, bearings can be easily serviced.
C. Provide flexible connectors at inlet and outlet of fans.
D. All fans shall be checked for proper rotation and be lubricated before start up.

END OF SECTION 23 34 10

SECTION 23 62 20 — AIR-COOLED SPLIT-SYSTEM HEAT PUMPS

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all air-cooled split-system heat pumps indicated on Drawings and specified herein.

1. 1 - 5 ton single-phase units. Outdoor mounted, air-cooled, split system heat pump unit suitable for ground or rooftop installation. Unit consists of a hermetic compressor, air cooled coil, propeller type condenser fan and controls box. Unit discharge air shall be upward. Unit will be used in a refrigeration circuit to match up to a packaged fan coil or coil assembly of the same manufacturer.

1.3 Quality Assurance:

A. Unit shall be rated in accordance with the latest edition of AHRI Standard 240.
B. Unit shall be certified for capacity and efficiency and listed in the latest AHRI directory.
C. Unit construction will comply with the latest editions of ANSI/ASHRAE and with NEC.
D. Unit will be constructed in accordance with UL standards and will carry the UL label of approval.
E. Unit cabinet will be capable of withstanding Federal Test Method Standard No. 141 500hr salt spray test.
F. Air cooled condenser coils shall be pressure tested and unit assembly leak tested.

1.4 Submittals:

A. Submit catalog data, Shop Drawings and installation instructions prior to commencement of work for all materials and equipment incorporated into the drawings and specified herein.

PART 2 — PRODUCTS

2.1 1-5 Ton Single-Phase Split-System Heat Pumps:

A. Equipment: Factory assembled, single piece, air cooled heat pump unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressor and refrigerant charge of R-410A.
B. Unit Cabinet: Unit cabinet will be constructed of galvanized steel, bonderized and coated with powder coat paint.
C. Fans:
1. Condenser fan will be direct drive propeller type discharging upward.
2. Condenser fan motors will be totally enclosed, single phase with class B insulation and permanently lubricated bearings.
3. Shafts will be corrosion resistant.

4. Fan blades will be dynamically balanced.
5. Condenser fan openings will be equipped with coated steel wire safety guards.

D. Compressor:
1. Compressor shall be hermitically sealed.
2. Compressor shall be mounted on rubber vibration isolators.

E. Condenser Coil:
1. Condenser coil shall be air cooled.
2. Coil shall be constructed of aluminum fins mechanically bonded to copper tubes which are then cleaned, dehydrated and sealed.

F. Refrigerant Components: Refrigerant circuit components shall include liquid and vapor line shutoff valve with sweat connections, system charge of R-410A refrigerant, POE compressor oil, accumulator and reversing valve.

G. Fan discharge and unit arrangement shall be as indicated on the plans.

H. Units will feature the following as standard:
1. Compressor crankcase heaters.
2. Compressor internal overload protection.
3. O.D. pressure taps for refrigerant pressure checks.
4. Refrigerant service valves.
5. Refrigerant filter dryer.
6. Electronic defrost control.
7. Outdoor temperature sensor.
8. Reversing Valve.
9. Hail Guards.
10. Compressor time delay relay.
11. High and low pressure protection.

I. Units will feature the following accessories when scheduled on the Drawings:
1. Outdoor low ambient to 0°F.

J. Equipment shall be Carrier, Trane or Lennox pending 10 day prior approval.

2.2 Warranty:

A. Unit shall have a one (1) year parts and five (5) year compressor warranty. Warranty period shall not begin until after Substantial Completion.

PART 3 — EXECUTION

3.1 General:

A. All equipment shall be installed in accordance with the recommendations of the manufacturer.

B. Refrigerant line sizes shall be determined in accordance with the manufacturer's recommendations. This contractor is responsible for any changes or accessories required due to the specific requirements of a particular manufacturer. All refrigerant lines shall be sized by the manufacturer and approved by the engineer prior to any work.

C. Provide and install any accessories necessary for a complete and functioning system.

D. All condensers shall be set on 6" thick concrete slabs for on grade installations. Roof mounted condensers shall be installed on restrained spring isolation curbs to withstand 50lbs./sqft along any face of the unit. The curb shall be designed by a Professional Engineer licensed in the project's state that has 5 years experience designing restrained curb systems. Installation instructions of how to mount the curb to the building's structure and the unit to the curb must be stamped by curb's design engineer and included in the submittals.

END OF SECTION 23 62 20

SECTION 23 85 11 — DUCTLESS MINI SPLIT HEAT PUMPS

PART 1 — GENERAL

1.1 System Description:
- A. Ductless split system ceiling recessed.

1.2 Quality Assurance:
- A. These units shall be listed by ETL and bear the ETL label.
- B. Units shall be rated in accordance to ARI standard 240HP and bear the ARI label.
- C. Units shall be manufactured in a facility that has met ISO 9002 and ISO 14001 international standards.
- D. A full charge of R-410A for a 25’ line set shall be provided in the condenser section.
- E. A dry air holding charge will be provided in the evaporator section.
- F. System SEER shall meet or exceed 16 SEER.

1.3 Handling and Storage:
- A. The wireless remote shall be packaged inside the carton with the evaporator section.
- B. Wired remote if required shall be shipped as a separate accessory item.
- C. Unit shall be handled and stored according to manufacturer's specifications.

PART 2 — PRODUCTS

2.1 Indoor Unit: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, control circuitry and fan motor. The unit shall have a factory installed Plasma/Electrostatic filter to clean return air. The unit shall have self-diagnostic function, 3-minute time delay, an auto restart function, dirty filter indicator, an emergency operation manual run switch. Indoor unit refrigeration piping shall be charged with a dry air holding charge instead of R-410A.

- A. Cabinet:
  1. The cabinet shall have a white finish smooth easy to clean surface with and indicator lights to verify functioning and trouble shooting.
  2. Return air shall enter through the top of the cabinet.
  3. There will be a factory supplied separate back plate (if applicable) for securely mounting the evaporator on the wall.
- B. Fan:
  1. Evaporator fan shall be direct drive DC motor.
  2. Fan shall be dynamically balanced and run with permanently lubricated bearings.
  3. A motorized air louver (up/down) shall provide automatic changes in air direction to provide a more uniform pattern of air distribution.
  4. Indoor fan shall provide 3 (3) speeds, High, Medium, Low.
- C. Filter:
  1. Factory furnished and installed.
- D. Coil:
  1. Evaporator shall be nonferrous construction with aluminum plate fins on copper tubing.

2. All tubing shall be factory brazed and leak checked prior to packaging at the factory.

E. Electrical:
1. Power requirement shall be 208/230/1/60.
2. Indoor unit will not have and supplemental electric strip type heat.

F. Control:
1. This unit shall have a wired controller to perform input function necessary for operation of unit.
2. Wired control shall have controls for temperature and time set, master control, air clean, auto swing louver, start/stop, fan and timer, control up to 16 indoor units.
3. Temperature changes shall be from 60^0F – 80^0F in one (1) degree increments.
4. Microprocessor located in the indoor unit shall have the capability to sense return air temperature, coil temperature and process the commands from the remote to operate the outdoor unit as required. Unit shall be capable of automatic restart when power is returned after a power outage.
5. Control signal shall be sent between the indoor unit and outdoor unit on the same wiring delivering voltage to the indoor unit.

2.2 Outdoor Unit: The outdoor unit is designed specifically for the matching indoor unit. The unit is equipped with circuit board that interfaces with the indoor unit. Unit is to be factory assembled, wired, piped and run tested prior to leaving the factory.

A. Unit Cabinet:
1. Cabinet will be constructed out of galvanized metal with a baked enamel finish.
2. Fan guard will be louvered to prevent entrance of foreign objects.

B. Fan:
1. Unit will have a direct drive propeller type fan.
2. Motor for fan will be DC voltage permanently lubricated and balanced prior to assembly.
3. Unit will have a horizontal discharge air flow.

C. Coil:
1. Condenser coil shall be nonferrous construction with aluminum plate fin on copper tubing.
2. Refrigerant flow leaving the condenser coil shall be controlled by a metering device.

D. Compressor:
1. Compressor shall be a rotary type or scroll type mounted in such a way to prevent noise and vibration transmission outside the cabinet.
2. Unit will be pre charged with R410A refrigerant to accommodate a 25’ line set without the addition or removal for Freon.
3. Unit will be capable of a maximum 165’ total line set with a height difference of no more than 65’ without the need to trap, change line sizes or add oil to the system.

E. Electrical:
1. The unit electrical requirement shall be 208/230/1/60.
2. The outdoor unit shall be controlled by a microprocessor.
3. Control voltage to and from the indoor unit shall occur on the same wiring delivering power.

PART 3 — EXECUTION

3.1 Start-up and Warranty:

A. The manufacturer shall provide a factory-trained representative to perform the start-up procedures as outlined in the Start-up, Operation and Maintenance manual provided. Start-up representative will provide all necessary set-up and configuration of the unit controls including communication to the BAS control system to ensure that the unit operates and communicates properly.

B. After the above services have been performed, the same factory-trained representative shall be available for a period of classroom instruction not less than 2 hours and to exceed 8 hours to instruct the owner's personnel in the proper operation and maintenance of the unit.

C. Standard unit warranty shall include a complete unit parts, labor and refrigerant warranty for a minimum of 1 year after substantial completion. Manufacturer shall coordinate with the Contractor and be aware of the anticipated construction timeframe for the project and provide allowance for warranty. The manufacturer shall provide an original factory warranty certificate for each unit listing model number, serial number and warranty coverage as specified. Warranty labor shall be performed only by manufacturer certified technicians. In addition, manufacturer shall include a 5 year replacement compressor parts.

END OF SECTION 23 85 11

SECTION 26 00 00 — ELECTRICAL

PART 1 — 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. This section of the specifications is coordinated with and complimentary to certain sections of the General Specifications. Specifically, the Contractor shall refer to "Instructions", "General Conditions", "Special Conditions", and all other relevant divisions of work. Applicable provisions of the General Conditions shall govern work under this heading as if written in full herein.

B. The Electrical Specifications shall be considered to be all inclusive in their individual divisions of work and shall refer to and be a part of all applicable parts of the General Specifications whether bound with these Specifications or whether handled as a separate document.

C. These Specifications are intended to provide for a complete electrical system. Any item(s) indicated on the Drawings and not specified or vice-versa, or any detail omitted which is necessary for the proper installation of the system, shall be supplied and installed by the Contractor without additional cost.

D. The Drawings and Specifications shall be considered complimentary one to the other so that materials or labor indicated, called for or implied by one and not the other shall be supplied as though called for by both.

E. The Electrical Contractor shall keep clean plans on the job and mark all changes (changes by addenda, change orders, re-routing of conduits or circuits to meet field conditions, etc.) made in the field. These changes shall be marked on the plans when they are made and not when the job is finished. This set of plans shall be turned over to the Architect or the Engineer through the General Contractor to be included in as-built plans.

1.3 Scope, Work Included:

A. The Electrical Contractor shall purchase and furnish all materials, wire, fixtures and equipment shown on the Electrical Drawings and covered by this section of the Specifications. The General Contractor or another subcontractor shall not be used to purchase materials with the intent to circumvent bid laws or to overcome poor credit on the part of the Electrical Contractor.

B. The Contractor shall:

1. Install complete system of electrical wiring to each lighting fixture, receptacle and switch outlet.
2. Install all lighting fixtures and other electrical equipment covered by this section of Specifications and Electrical Drawings.
3. Install empty conduit for thermostat and control circuits as shown on mechanical or electrical drawings and/or specified under Division 23 of the Specifications.
4. Install all power wiring and make electrical connections to heating, air conditioning, ventilation and other electric consuming equipment that is furnished

and installed by other trades. Proper starter(s) and interior controls, including control wiring, shall be furnished with equipment with all wiring brought out to terminal block or junction box.

5. Install a new fire alarm system as shown and specified on plans.
6. Install empty conduit for computer outlets as shown.
7. Install empty conduit for security system as shown.
8. Install empty conduit and backboard for telephone system as shown.

1.4 Work By Others:

A. All patching and finishing, painting of conduits, equipment and panel trim.
B. All furring for spaces in which conduit and other electrical work may be installed.
C. All heating, air conditioning, ventilation and other electric consuming equipment covered by other sections of the Specifications and associated control wiring.

1.5 Codes, Laws and Ordinances:

A. All material and workmanship shall comply with National Electrical Code (2014), state laws, local ordinances.
B. In cases of differences between building codes, state laws, local ordinances and utility regulations and the Contract Document, the most stringent shall govern. The Contractor shall promptly notify the Engineer and/or Architect in writing of any such difference. Should the Contractor perform any work that does not comply with such requirements, he shall bear all costs arising in correcting the deficiencies.

1.6 Experience of Bidders:

A. Electrical contracting shall be the primary business of bidders under this section of the Specifications, and the bidder shall have installed at least three (3) similar type and size projects.
B. The bidder shall submit proof of similar projects when requested by the Architect or Engineer. Proof shall include all of the following:
   1. Name of project
   2. Date of completion
   3. General description of electrical work
   4. Approximate dollar value of electrical installation
   5. Name of electrical design and inspecting engineer.
C. The bidder shall have an active license by the Alabama Electrical Contractors Board as an Electrical Contractor and shall submit proof of license when requested. A local business permit or local electrical contracting license will not be considered sufficient. The required Alabama license shall not have "provisional" limitations and any such limitations will cause the licensee to be rejected from the project.
D. Regardless of the bidding amount, the Electrical Contractor shall be actively licensed by the State of Alabama as a General Contractor with specialty in Electrical. An Electrical Contractor who is licensed only as a sub-contractor type "S" license is limited to bidding through a licensed Prime General Contractor.
E. The bidder shall have practiced electrical contracting under his current business name for a minimum of three (3) consecutive years.
F. The Electrical Contractor shall provide substantiating proof of these requirements a minimum of 5 days prior to bid date to the Electrical Engineer. If substantiating proof is not submitted and approved, the Electrical Contractor will not be allowed to bid or perform work on the project.

G. When pre-qualification of electrical sub-contractors are required prior to bidding, each potential sub-contractor shall enclose in his pre-qualification documents the Company's latest audited financial statement or a current letter of reference from his bank or primary lending institution indicating good financial standing.
H. The Engineer reserves the right to dismiss any contractor that he feels does not have sufficient experience or whose quality of work would not be in the best interest of the Owner.

1.7 Responsibility of Bidders:
A. Before submitting proposal, each Bidder shall examine all Drawings and Specifications, equipment space allocated, and site of work to determine character of work. No consideration will be given at a later date to alleged misunderstanding as to requirements of work, materials to be furnished, or conditions required by nature of site.
B. Items obviously omitted from Specifications and/or Drawings by oversight or error shall be called to the attention of the Engineer and/or Architect before submitting bids. After award of Contract, any changes in materials, fixtures, equipment, etc., or any rearrangement necessary to complete Contract, shall be at the expense of the Contractor.
C. This Contractor shall pay additional cost that may be incurred by other trades due to the installation of equipment or material, covered by this section of Specifications and Electrical Drawings, which differ from that specified even though such equipment or materials has been approved by the Architect and/or Engineer.

1.8 Fees and Permits:
A. This Contractor shall secure all licenses and permits, and pay all fees required for completion of work under this section of the Specifications.
B. This Contractor shall be licensed by the State of Alabama as an Electrical Contractor. A simple business license from the local municipality is not sufficient.

1.9 Supervision:
A. This Contractor shall be held strictly responsible for the proper installation of the complete electrical system. He shall keep a competent superintendent or foreman on the job site throughout the progress of the Work. The foreman shall not be removed or replaced from the project except by written approval from the Engineer.
B. The foreman shall, as a minimum, have 5 years of experience in similar type commercial projects and shall hold a 10 hour OSHA card for safety training. A minimum of 50% of the electrical laborers on the construction site shall each hold a 10 hour OSHA card for safety training.

1.10 Changes and Additional Work: No changes shall be made from the work as called for by these Specifications and Drawings, except on written order of the Architect. No charge for extra work will be allowed unless such extra work has been duly authorized by a written order of the Architect stating the change to be made.

1.11 Warranty:
A. In addition to the customary manufacturer's guarantee on materials, this Contractor shall guarantee all materials and equipment furnished by him and all workmanship incidental to the Electrical Contract for a period of one (1) year following the date of final inspection and approval. Any defective material or workmanship which becomes

apparent during the one year period shall be replaced by him without additional cost to the Owner.

B. Lamps that burn out from use by the Owner after date of final inspection and approval shall not be covered by the one (1) year warranty. The Contractor shall replace any light bulbs that have had excessive use during construction or before date that Owner accepts the building.

C. All ballasts shall be covered by the warranty and any ballast that fails during the first year shall be replaced by this Contractor at no cost to Owner.

1.12 Emergency Repairs: The Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding the Contractor's guarantee bond nor relieving the Contractor of his responsibility during the warranty period.

1.13 Submittal Data:

A. The Contractor shall prepare data for submitting to the Engineer based upon all equipment, panels, motors, etc., he proposes to furnish as specified and shown on the Drawings. Partial submittal will not be accepted.

B. Within twenty (20) days after award of the Contract, the Contractor shall submit THROUGH THE GENERAL CONTRACTOR, a minimum of six (6) sets of all engineering data pertaining to all equipment, materials, etc., he proposes to furnish for this project.

C. The Submittal Data shall include the following:
   1. On the exterior of the folder, the Contractor's name, address, telephone number and the job name.
   2. On the first page, a copy of the letter of transmittal from the Contractor to the Engineer listing each item of material and equipment contained therein (in the order they appear in the Specifications) the make, vendor, where used and number sets being transmitted.

D. The data shall include the following: Operational Data, Shop Drawings, Dimension Drawings of Equipment and Structures, Fixture Data, Voltage, Speed and Catalog Engineering Data Sheets, Rough-In Drawings, and any other data required to verify compliance with the Specifications.

E. Each item shall be clearly marked to indicate its use and to show any deviation from the Specifications.

F. Submittals shall include at least the following items:
   1. Lighting Fixtures
   2. Disconnect Switches
   3. Receptacles
   4. Toggle Switches
   5. Device Plates
   6. Panelboards
   7. Surge Protective Devices
   8. Fire Alarm

1.14 Submittal Samples:

A. The Contractor shall submit THROUGH THE GENERAL CONTRACTOR a sample of each of the following items proposed for use on the project:
   1. 18" of each type of wire to be used
   2. 18" of each type of conduit to be used
   3. One standard receptacle

4. One standard lighting toggle switch
5. One receptacle device plate

B. The Engineer will evaluate the samples and compare them to those specified. A written report will be prepared and forwarded to the Contractor. Submitted samples will not be returned.

C. The Engineer may choose to waive the sample requirement under the following circumstances:
   1. The Contractor submits appropriate catalog literature of intended devices that meet the Specification.
   2. The Contractor has submitted samples of the specified devices on a previous project to the Engineer.

1.15 Standard of Materials and Workmanship:

A. All materials, equipment and apparatus covered by this Specification shall be new, of current manufacture and shall bear the seal of approval of the Underwriters' Laboratories, Incorporated, (UL) wherever standards have been established by that agency. Where UL standards do not exist, consideration will be given to certified test reports of an adequately equipped, recognized independent testing laboratory qualified to perform such testing. Defective equipment and/or equipment damaged during installation or testing shall be replaced or repaired in a manner meeting with approval of the Engineer.

B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance when completed. Work shall be installed in accordance with NECA 1-2006, Standard for Good Workmanship in Electrical Contracting.

1.16 Inspections: All work shall be completely installed and tested as required by this section of the Specifications and by all codes and ordinances before inspection is requested. All tests shall be repeated to the satisfaction of those making the inspection. All work shall be subject to inspection by the Architect, Engineer or their representative at all times.

1.17 Coordination:

A. This Contractor shall coordinate his work with other trades, installing the system and equipment furnished by him in such a manner as to avoid interferences. All changes required in the work of the Contractor caused by his neglect to do so shall be made by him at his own expense.

B. Discrepancies between scale and dimensions or between architectural, structural, mechanical and/or electrical drawings shall be called to the Architect's attention immediately.

1.18 Grounding:

A. Grounding system shall meet all requirements of Article 250 of the National Electric Code and shall meet additional requirements as specified herein and on the Drawings.

PART 2 — PRODUCTS

2.1 Distribution Centers and Panelboards:

A. Provide distribution centers including main panel and local panelboards for power, light and appliances; complete with wired protective devices, accessories, enclosed in cabinets, as indicated and specified herein and on plans.
B. Wiring scheme, equipment, arrangement, and structure outline dimensions shall be substantially as indicated.
C. Incoming service shall be 208Y/120V, 3 phase, 4 wire.
D. Provide inside cabinet door of each panel a framed (typed) directory listing all circuits as connected to panel. Where a door is not provided on distribution panels, engraved micarta nameplates shall be located adjacent to breakers and firmly attached using screws.
E. Panelboard circuit numbers shall be permanently attached or embossed. Circuit breakers shall not be numbered with paper adhesive tape.
F. Each panel shall be furnished with an identification plate as specified in the "Equipment Identification" section of this specification. Identification plate shall be firmly attached using screws.
G. Adhesive cable tie mounts and plastic cable ties shall be used for wire management inside panelboards.
H. A sign shall be located at each panel warning of potential electric arc flash hazards per NEC 110.16 requirements.
I. Interrupting ratings shall be coordinated with the available short circuit current. Series rating is unacceptable.
J. All panels shall be provided with an equipment grounding bus similar to but isolated from the solid neutral bus. Provide bonding between the grounding bus and neutral bus in the service entrance equipment only.
K. The main service panel shall bear a UL label approving it as acceptable as service entrance equipment.
L. When a panelboard is two sections, both sections shall be equal in physical size and capable of having the same quantity of breakers.
M. Panel enclosures shall be furnished without knockouts. All knockouts shall be field cut.
N. Panels shall be carefully aligned and rigidly secured in place with the top of the cabinets located 78 inches above the finished floor.
O. Branch circuit protection devices shall be molded case circuit breakers bolt-on type. Multi-pole breakers shall be designed such that an overload in any phase will trip all poles simultaneously.
P. Schedule of distribution centers is indicated on plans and includes the following information:
    1. Identifying number or letter
    2. Location
    3. Circuit numbers
    4. Circuit breakers trip sizes
    5. Spare circuit breakers, number and rating
    6. Feeder circuit sizes
Q. Switchboards and panelboards shall be as manufactured by Square "D", Siemens, Cutler-Hammer, G.E. or approved equal. Brand and numbers given on plans are to establish standards of quality and requirements.

2.2 Conduit and Fittings:
A. Conduit in concrete or corrosive areas shall be plastic conduit equal to Carlon Type 40, PVC conduit shall meet and be installed in accordance with all requirements of

Article 347 of the NEC. A ground wire must be installed in each conduit and proper connections made at panels, receptacles, switches, lights, etc., to make a continuous grounding system. Where any circuit in non-metallic conduit extends above ground, a fitting shall be installed to convert to metallic conduit.

B. Conduit exposed to weather or in wet locations shall be rigid galvanized metal. PVC conduit shall not be used above ground.
C. Where conduit enters or exits the top of an exterior enclosure, a Myers type weatherproof hub shall be used.
D. Conduit from a junction box to lighting fixtures, motors, etc., inside the buildings may be flexible metal as provided for in Article 350 of NEC.
E. Conduit from a junction box or local disconnect switch to AC unit, etc., outside the buildings shall be Liquid-Tight Flexible Metal as provided for in Article 351 of NEC.
F. Any raceways that are installed exposed in finished areas shall be metallic Wiremold type raceways. Prior approval from the Architect is required for any exposed raceways.
G. All other conduit shall be galvanized or sherodized electrical metal tubing (thin wall).
H. Conduit within open-celled concrete blocks shall be EMT. When installed in pour filled blocks, EMT shall have corrosion protection and suitable for that condition.
I. Conduit sizes shall be as indicated; where not indicated, sizes shall meet NEC requirements for number of conductors to be accommodated. Do not install conduit smaller than 1/2".
J. Electrical Metallic Tubing shall be hot-dipped galvanized and manufactured in accordance with UL Standard #797 and installed according to Article 348 of the NEC.
K. All metallic fittings shall be constructed of steel. Cast fittings will be rejected.
L. Type MC and AC cable shall be used only as final connections to light fixtures from junction boxes in lengths of less than 6 feet or when fishing inside pre-existing walls. Light fixtures shall not be connected in a daisy-chain manner.
M. Plastic conduit bushings equal to Arlington Industries EMT series shall be used where conduits stub above ceilings without terminating into a box.

2.3 Conductors:

A. All conductors shall be copper of not less than 98% conductivity and sized based on Drawings. Conductors sized #6 and smaller shall be Type THHN or THWN. Conductors sized #4 and larger shall be Type RHW/USE, RHW-2 or XHHW. Aluminum conductors shall not be used.
B. Conductors #8 and larger shall be stranded. Conductors #10 and smaller shall be solid.
C. No conductor smaller than #12 will be allowed for branch circuits. Reduced size conductor tapping is prohibited.
D. All equipment grounding (ground) conductors shall be bare or have green covering.
E. Wiring shall be color coded as follows:
    1. 208 wye/120 volt, 3 phase, 4 wire solid neutral:
        a) Phase A Black
        b) Phase B Red
        c) Phase C Blue
        d) Neutral White
        e) Ground Green
F. Phase conductors #10 and smaller shall have colored insulation. Phase conductors sized #8 and larger may have colored insulation or may have colored electrical tape

wrapped on the outside of black insulation at every termination point. In no case shall colored tape be used to change the color coding of colored insulation.

G. Grounded conductors (neutrals) sized #6 and smaller shall have white insulation per the voltage system as listed above and in accordance with N.E.C. section 200.6. Colored tape is not acceptable on neutral conductors sized #6 and smaller. Neutral conductors sized larger than #6 may have colored insulation or may have colored electrical tape wrapped on the outside of black insulation at every termination point.
H. The wiring system shall be color coded as required by the Specification in each junction box, pull box, outlet box, safety switch, panel, etc., and at each termination or splice.
I. Adhesive cable tie mounts and plastic cable ties shall be used for wire management inside panelboards.

2.4 Pull or Junction Boxes:

A. Provide pull or junction boxes where indicated and where directed to facilitate the pulling of conductors.
B. For concealed conduit, make boxes flush with wall.
C. Make box covers accessible and easily removable.
D. Boxes shall have no opening except those through which conduit pass.
E. Where possible, use standard size junction boxes, conforming to NEC requirements.
F. For special size junction boxes, fabricate of galvanized steel as indicated.

2.5 Outlet Boxes:

A. Provide outlet boxes of galvanized stamped steel, malleable iron or of nonferrous metal for convenience outlet receptacles, wall switches, and other devices indicated or required as specified.
B. Outlet boxes shall be of approved design and manufacture. Each type shall be of form and dimensions adapted to specific location, device which it is to enclose, fixture it is to support, and type, number and arrangement of conduits connecting to it.
C. Where standard make boxes are not suitable, provide boxes of special design to fit space, other requirements, as approved.
D. Outlet boxes shall be of flush mounted design unless otherwise indicated or specified.
E. Outlet box supports shall be Steel City "SV" type or approved equal. **Caddy type "Far-Side" clips that depend on sheetrock for support shall not be used.**
F. Open "knockouts" in outlet boxes only if required for inserting conduit.
G. Outlet boxes in concrete block walls shall be masonry boxes and shall be mounted flush with surface of the wall.
H. All outlet boxes shall be installed in accordance with Paragraph 314.20 of the NEC which reads as follows: "In walls or ceilings with a surface of concrete, tile, gypsum, plaster, or other non-combustible material, boxes employing a flush-type cover or faceplate shall be installed so that the front edge of the box, plaster ring, extension ring, or listed extender will not be set back of the finished surface more than ¼ inch."
I. Where outlets show movement due to wall over-cuts or errors in flush mounting of boxes, levelers as manufactured by Caddy or equivalent shall be used for additional bracing.
J. Outlet boxes that are for future devices shall be provided with a blank cover plate as specified below. At the end of project construction, any rough-in boxes that have not been used shall be considered as intended for future devices and shall have blank cover plates installed.

2.6 Wiring Devices:

A. Switches, receptacles and other wiring devices shall be as manufactured by General Electric, Hubbell, Leviton, P & S or approved equal. All devices and associated wall plates shall have a color as selected by the Architect. Devices shall be commercial specification grade.

B. Receptacles and Outlets:
   1. Unless otherwise shown, manufacturer's catalog numbers specified for receptacles refer to Hubbell. The phrase "or approved equal" is understood to be appended to each number.
   2. Receptacles shall be duplex, specification grade, 20 amp 120 volt; capable of receiving either standard 2-prong or 3-prong polarized plugs to fit their outlet boxes and cover plates; No. CR20(*).

C. Wall Switches:
   1. Fasten switches to outlet boxes firmly; do not depend on cover plate to pull them tight.
   2. Wall switches shall be 20 amp 120-270 volt, a.c., tumbler type with operating mechanism totally enclosed; Hubbell or approved equal:
      a) 1 pole, 20 amp #CS120(*)
      b) 3 way, 20 amp #CS320(*)
      c) 4 way, 20 amp #CS420(*)
   3. Dimmer switches shall be slide type with minimum ratings equal to the load connected. Dimmers shall be properly de-rated when ganged together. Low voltage dimmers (0-10 volts) shall be used where necessary and shall be selected to operate with the specific intended light fixtures. Dimmers shall be fully compatible with their associated light fixtures. Unless otherwise noted, dimmers shall reduce their associated light levels to 1% or less of full brightness.
   4. Where more than one switch is indicated in one location, or a switch and convenience outlet are indicated together, mount in gangs under common plate.

D. Plates:
   1. Plates for convenience outlets and wall switches shall be specification grade smooth nylon or stainless steel as selected by the Architect.
   2. Plates for empty junction boxes that occur in a finished area shall match above. Use device straps on boxes as required to install these plates.
   3. Covers for outdoor receptacles shall be rated for wet location when in use. Hinges shall be installed on top.

2.7 Lighting Fixtures:

A. Furnish and install lighting fixtures, including proper lamps, as specified in Fixture Schedule on the Drawings.

B. All recessed fixtures shall be complete with appropriate frames and installed in complete cooperation with the air conditioning and ceiling contractors so as to secure a completely coordinated installation.

C. If lighting fixtures are ordered with factory mounted fixture whips, those whips shall be #12 AWG copper conductors minimum in lengths of 72 inches or less. Fixture whips made in the field shall also be #12 copper minimum.

D. All lamps shall have a color rating of 4000 degrees Kelvin unless noted otherwise on the fixture schedule.

E. All lamps shall have a color rendering index of 80 unless noted otherwise on the fixture schedule.

F. The Contractor shall furnish and install lamps with type and sizes shown in the Fixture Schedule.

2.8 Safety Switches:

A. Safety switches shall be Type "HD" (heavy duty) unless noted otherwise, fused or non-fusible as indicated with number of poles as shown or required. Safety switches for equipment may be non-fused only if equipment is UL tested with circuit breaker protection.
B. Switches shall be rated 250 volts or 600 volts as required.
C. Switch enclosures shall be of the NEMA configuration required (i.e. NEMA 1 for general purpose, NEMA 3R for raintight, etc., as required or shown).
D. Disconnect switches shall be provided for all motors and equipment indicated or required by the National Electric Code.
E. Safety switches shall be provided by the same manufacturers as the panelboards.

2.9 Motors, Controls, and Control Wiring:

A. All motors shall be furnished and installed under Division 23, MECHANICAL, but shall be electrically connected for correct rotation under this section.
B. Controllers shall be furnished under Division 23, MECHANICAL, unless noted otherwise herein or on the Drawings, but shall be mounted and electrically connected for correct operation under this section (except starters which are included as an integral part of the specific equipment).
C. All control wiring shall be furnished and installed under Division 23, MECHANICAL, unless noted otherwise herein or on the Drawings.
D. Provide empty conduit from thermostats to mechanical units. Provide outlet box for thermostat mounting. Coordinate with mechanical for locations.
E. Manual starters (motor snap switches) shall be provided under this section for all fractional motors 1/8 HP or greater. Starters shall include thermal overload element for motor protection and shall be equal to Square D Type F.

2.10 Relays, Contactors, Timeclocks, and Photocells:

A. Relays and contactors shall be electrically operated, electrically or mechanically held as necessary. They shall be mounted in a NEMA-1 enclosure ad shall be of the rating and type as indicated on the Drawings. They shall be capable of switching inductive and resistive loads.
B. Photocells shall be rated for a minimum of 1800 watts, rated for the voltage and fixture type connected, shall be hardwired and shall be equal to Intermatic model K4136M.

2.11 Surge Protective Devices:

A. Provide surge protective devices (SPD) as shown on the drawings and specified herein.
B. Surge protection devices shall be installed in accordance with the National Electrical Code. Products shall be configured for parallel installation - series designs are not acceptable. Products shall be mounted as close as possible to the associated panel with minimum wire lengths and no sharp wire bends.
C. Service entrance surge suppression shall have a maximum single withstand rating per phase of 200,000 amps. The suppression unit shall be rated 120/208 volt, 3 phase, 4 wire Wye and shall have a UL1449 clamping level of 400 volts. The SPD

and associated hardware shall be listed to UL 1449 (3rd Edition), as defined by ANSI/NFPA 70. The SPD shall be mounted in a NEMA 1 enclosure.

D. Branch circuit surge suppression (208 volt) shall be rated for a minimum of 80,000 amps peak current per phase at 120/208 volts, shall have voltage protection levels of 800V (L-N) and 700V (N-G) for ANSI/IEEE C62.41-1991 B3/C1 test category, shall have EM1/RFI filtering, and shall be UL 1449, Third Edition listed.

E. Unless noted otherwise, surge protective devices shall be mounted external to the associated panelboard.

F. Standard size overcurrent protection has been shown for connecting the surge protective devices. If a specific manufacturer requires something other than the standard that is shown, the appropriately sized breaker shall be installed.

G. Suppressors shall be as manufactured by Wiremold, Innovative Technologies, Cutler-Hammer, Intermatic, Mersen (Ferraz-Shawmut), Square D, General Electric, APT, Siemens, LEA, Surge Suppression Incorporated, or approved equal.

2.12 Telephone/Data Systems:

A. Provide outlet boxes and conduit stub-outs as shown for telephone/data outlets.

B. Cabling, devices, and termination will be provided under separate contract.

C. Provide plastic bushings on conduit ends.

D. Conduit shall be 3/4" EMT minimum.

PART 3 — EXECUTION

3.1 Grounding:

A. Grounding system shall meet all requirements of Article 250 of the National Electrical Code. In general, a ground wire shall be installed in every conduit. The conduit installation itself shall serve as an additional grounding means.

B. All grounding conductors shall be copper. Sizes No. 10 AWG and smaller shall be provided with a green colored insulation. Sizes No. 8 AWG and larger shall be marked with green tape. Grounding conductors shall be marked at each pull box, enclosure, starter, disconnect switch, panelboard, etc.

C. The main service ground shall consist of a grounding electrode conductor, protected by rigid galvanized conduit as needed, and sized as shown on the Drawings. Service grounding shall be as follows:

1. The grounding electrode conductor shall extend from the main ground bus in the service entrance equipment to the main metallic cold water pipe (where available). Water pipe connection shall be with a ground fitting that bonds both conduit and conductor to the water pipe. Pipes shall be thoroughly cleaned before ground fittings and clamps are installed.
2. The grounding electrode shall be connected to the building structural steel.
3. In addition to the ground system described above, a supplementary ground system shall be installed consisting of a copper conductor, sized the same as the main grounding conductor, extending from the main ground bus to two (2) 5/8" x 10' copper clad steel ground rods spaced a minimum of 6' apart.
4. The grounded conductor (neutral) bus and the equipment ground bus shall be connected at the supply side of the main secondary circuit breakers in accordance with the National Electrical Code. The service entrance panel shall be provided with a neutral disconnecting means and a separate bonding strap on the line side of the neutral.

D. Provide grounding for entire electric installation as indicated and specified herein. Following are included as requiring grounding:
   1. Conduits and other conductor enclosures.
   2. Neutral or "grounded conductor" of interior wiring system at the main electrical service.
   3. Lighting panel boards, control centers, etc.
   4. Non-current-carrying metal parts of fixed equipment such as motors and lighting fixtures.
   5. Grounding screw for every receptacle and switch.

E. The required grounding conductor shall be installed in the common conduit with the related phase and neutral conductors. Where there are parallel feeders installed in more than one raceway, each raceway shall have a ground conductor.

F. Where metallic conduits terminate without mechanical connection (i.e. locknuts and bushings) to service entrance equipment and for all sizes of metallic conduit (rigid or flexible) terminating in concentric or eccentric knockouts, the following procedure shall be followed: Each conduit shall be provided with an insulating ground bushing and each bushing connected with a bare copper conductor to the ground bus in the electrical equipment. The ground conductor shall be in accordance with the article on Grounding of NEC.

3.2 Interior Wiring:

A. General:
   1. Interior wiring shall include electrical conduits, conductors, wiring devices, supports, other materials and their installation, required to distribute electric current from distribution centers for all purposes, as indicated and specified.
   2. Conduit runs as indicated are diagrammatic; exact routing of conduit shall suit job conditions. Where conduits are exposed, they shall be installed in a neat manner.
   3. Lighting fixtures shall not be daisy-chained together.
   4. Roughing-in dimensions of electrically-operated units will be furnished by trades supplying the same. Set conduit boxes for connecting to units only after receiving approved dimensions and after checking locations with Contractors.
   5. All wiring shall be protected from painting. Any wiring where the color coding is unreadable due to paint shall be cleaned before final inspection
   6. When installing receptacle outlets, devices shall be oriented with the grounding prong in the same direction throughout the project. Local jurisdiction requirements shall apply to orientation.
   7. Back-wiring of receptacles is not acceptable. Connections must be made to screw posts. The grounded conductor (neutral) shall not depend on the connection of a receptacle to complete the circuit (i.e. The two screws of a receptacle neutral shall not be used to splice the neutral).
   8. All wiring shall be tested with Meggar-type equipment before final inspection. Testing shall consist of applying 1000 volts across each conductor to check for short circuits and torn insulation.
   9. Junction boxes shall be solidly fastened to the building structure. Boxes shall not be solely supported by conduit.
   10. Low voltage cabling that is routed above the ceiling and not within conduit shall be properly supported so that it does not lay on a ceiling grid or ceiling tiles.

B. Interior Conduit Installation:

1. Extend conduits from distribution center through pull and junction boxes, panelboards to outlet boxes; bond throughout to make each circuit continuous from service to outlet.
2. Install conduits in wall, above ceilings, or under floors as shown.
3. Locate conduits in partitions accurately so as to conceal them completely; do not expose conduit bends at floor.
4. Install conduit in walls and partitions as nearly vertical as possible; horizontally only where unavoidable; never diagonally.
5. Make field bends and offsets uniform and symmetrical, without flattening conduit or scarring conduit finish; of minimum radius not less than six (6) times the diameter of the conduit.
6. Where plastic (PVC) conduit is used, all field bends must be made with Hotbox type bends. A torch shall not be used to heat conduit for bending.
7. Install conduit with minimum number of joints; join with approved couplings and fittings; make joints butted.
8. Cut conduit with hacksaw or approved pipe cutter using cutting knives; ream ends to remove burrs and sharp edges.
9. In damp locations, install conduit, fittings, boxes of type and manner to prevent moisture from entering conduit system.
10. Cap or plug conduit ends during construction; cap or plug ends of conduit that are to remain empty after test; make watertight.
11. Locate conduits at least 6" from steam pipes, hot water pipes, or other hot surfaces.
12. Do not pull wires before conduit and outlet boxes are permanently secured in place or before building roof is installed.
13. Support each conduit within 36 inches of junction and outlet boxes. Fastening of unbroken lengths of EMT shall be permitted to increase to 60 inches where structural members do not readily permit fastening within 36 inches.
14. Any conduit that stubs above ceiling without termination into a junction box shall have a plastic bushing permanently installed.
15. All empty conduits shall have a nylon pull cord.
16. Provide metallic conduit sleeves for all low voltage cables that penetrate fire rated barriers.
17. Where raceways contain 4 AWG or larger conductors, insulated fittings shall be used at every cabinet, box, or enclosure in accordance with NEC 300.4(G) requirements.
18. Flexible conduit and MC cable shall be properly supported in such a way that it does not lay on the ceiling grid or ceiling tiles.

3.3 Outlet Locations:

A. Indicated outlet locations are approximate. Consult details, sections, and elevations of Contract Drawings and roughing-in drawings of electric consuming equipment in order to determine exact locations.
B. In locating outlets, allow for overhead pipes, ducts, other obstructions; also, for variations in thickness of fire-proofing, sound-proofing, plastering.
C. Where rows of ceiling outlets occur, align them carefully.
D. Take care in locating wall outlets with regard to paneling, door and window trim; center them accurately.
E. Locate wall outlets of same type at same level above floor except where otherwise directed.

F. Locate outlets at following distances from finished floor to center of outlet, unless otherwise indicated:
Wall switches: 4'-0" maximum (to center of box).
Convenience outlets in finished rooms: 1'-6" or as shown.
Thermostat: As shown on HVAC plans.
1. Note: Where outlet or switch boxes are to be installed in concrete block wall, adjust height, if necessary, to make bottom of box be in mortar joint.

G. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols. No more outlets than are indicated shall be connected to a circuit unless authorized in writing by the project Engineer.

3.4 Identification:

A. Equipment identification shall be made using engraved laminated phenolic or Micarta plates (indented tape labels will not be permitted). Characters shall be white on a black background and 1/4" high minimum. Plates shall be secured to the panels by means of screws or metal pressure pins. Cement, by itself, will not be acceptable. All nameplates shall be mounted on the outside surface of the piece of equipment.

B. Panelboards shall be identified indicating panel designation from the Drawings, electrical characteristics and source in accordance with NEC 408.4(B). For example, a 120/208 volt 3 phase panel designated "LPA" and served from panel "MPA" shall be labeled as follows:

LPA
120/208V, 3 PH
Fed from MPA

C. Each junction box cover shall be labeled with a permanent "magic" marker or other means to identify the circuits within. For example, a junction box containing lighting circuits 21, 23, 25 from panel "L2A" would be labeled "L2A-21, 23, 25". Telephone junction boxes shall be labeled "T". Fire alarm, public address, and other system junction boxes shall be labeled accordingly.

D. All conductors shall be color coded as identified in Paragraph "Conductors". Branch circuit conductors in lighting and appliance panels shall be marked with circuit number.

3.5 Fireproofing: All conduit and boxes passing through or installed within fire walls and smoke walls shall be installed so as to maintain the integrity of the wall through which it passes. Fire barrier penetrations shall be made in accordance with a UL listed assembly. Boxes shall be installed within 1/4" of wall surface. Metallic conduit sleeves shall be provided for every cable penetration through a fire rated barrier.

3.6 Clean-Up: When the job is complete in every detail and building is ready for occupancy, the Contractor shall make a careful examination of all areas and see that all are in first class condition, all equipment working properly, and that all equipment and fixtures are properly cleaned, leaving all apparatus in first class condition. He shall remove all boxes, trash, etc., pertaining to his contract from the job site.

END OF SECTION 26 00 00

SECTION 28 31 00 — FIRE ALARM AND DETECTION SYSTEM

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of fire alarm and detection system indicated on Drawings and specified herein.

1.3 System Description:

A. System shall be an addressable, supervised, non-coded automatic fire alarm system consisting of control panel, power supplies, addressable alarm initiating devices, alarm indicating devices, and off-site communicating devices.

B. Class "B" signaling line circuits and Class "B" indicating device circuits including end-of-line devices.

C. Performance Requirements:

1. Operation of manual station or automatic activation of any smoke detector shall:
   a) Cause system evacuation devices to operate.
   b) Indicate device in alarm on control panel.
   c) Initiate off-site alarm notification system.
   d) Shut-down appropriate air handling units.
2. System shall return to normal when operated device is returned to normal and control panel is manually reset, except alarms may be silenced as specified below.
3. Strobe light flash rate shall be synchronized.
4. Alarm may be silenced by switch in control panel.
   a) Ring Back Feature: When silenced, this shall not prevent the resounding of subsequent alarms if another zone should alarm.
5. When alarms are silenced, device indicating display on control panel shall remain on until operated device is returned to normal and control panel is manually reset.
6. Green pilot LED shall normally be on indicating that system is receiving normal power. Failure of normal power shall cause this LED to extinguish.
7. Amber trouble LED and trouble alarm, operating together, shall signal trouble condition.
   a) Following conditions shall signal trouble condition:
      (1) Failure of normal power.
      (2) Opens or short circuits on indicating circuits.
      (3) Disarrangements in system wiring.
      (4) Control panel circuit board removal.
      (5) Ground faults.

1.4 Submittals:

A. Shop Drawings:

1. Shop drawings shall be prepared by authorized factory representative and include:
   a) Wiring floor plan of system showing cable requirements and routing.

b) Manufacturer's original catalog data and descriptive information on each piece of equipment to be used.
c) Manufacturer's data on integral surge protection.

B. Instruction Manual: Provide instruction manual from Manufacturer which explains what is to be done in the event of various indications.

1.5 Quality Assurance:

A. Regulatory Requirements:
1. System shall meet approval of authority having jurisdiction (AHJ).
2. Equipment, devices, and cable shall be UL or Factory Mutual listed for use in fire alarm systems.
3. **The installing Contractor shall have an active Certified Fire Alarm Contractor Permit as issued by the State of Alabama Department of Insurance Fire Marshal's Office. Proof of permit shall be provided to the Architect at the pre-construction meeting or to the project engineer when required. A copy of the permit shall be submitted by the General Contractor when he submits the list of sub-contractors for the project.**
4. The installing Contractor shall be under contract with the Fire Alarm manufacturer as an Engineered Systems Distributor.
5. The system shall be installed in accordance with the Alabama Certified Fire Alarm Act.

1.6 Owner's Instructions: Instruct Owner's representative in proper operation and maintenance procedures.

PART 2 — PRODUCTS

2.1 Approved Manufacturers:

A. Bosch
B. Edwards EST
C. Fike
D. Gamewell
E. Mircom Technologies
F. Notifier
G. Simplex

2.2 Components:

A. Equipment and accessories furnished under terms of this Specification shall be standard products of single manufacturer, or include written statement by Control Panel Manufacturer confirming compatibility of components and inclusion of these components under system warranty.
B. Control Panel:
1. Listed under UL standard 864.
2. Solid state modular design with flush or semi-flush mounting.
3. Control functions shall be behind locked door with annunciating devices visible through the door. Single key shall operate all keyed functions in system including manual pull-stations. Provide a minimum of three keys.
4. Each device shall be electrically supervised in accordance with wiring style specified.

5. Provide integral surge protection.
6. Make provisions for connection to off-site alarm notification system. Provide separate dry contacts for alarm and supervisory/trouble alarms.
7. Power Supply:
    a. Provide green LED indication of normal power supply.
    b. Loss of normal power shall activate trouble alarm.
    c. Meet requirements of and size in accordance with UL Standard 1481 and NFPA 72.
    d. Include standby batteries, charger, and automatic transfer equipment.
8. Visual Annunciation:
    a. Separate indication on each device for alarm, trouble, or supervisory conditions.
    b. Visual indication shall be by crystal display or other easily identifiable method.
    c. Device names, not numbers, shall be programmed into the control panel in a logical manner.
    d. Fault or trouble condition on any zone shall not affect any other zone.
9. Audible Horn Alarm Annunciation:
    a. Provide separate and distinct alarm signals for alarm and trouble conditions.
    b. Alarm signal shall also operate strobe lights.
    c. Provide alarm silence switches at control panel.
    d. Trouble alarm shall be horn integral to control panel.
    e. Supervisory alarm may be same audible alarm as trouble alarm, but with separate visual annunciation.

C. Off-Site Alarm Notification System:
1. Provide dual telephone line connections from telephone terminal board to fire alarm control panel.
2. Alternative forms of communication (radio, cellular, etc.) will be considered when allowed by the local jurisdiction.
3. Provide one (1) year of system telephone/radio monitoring in contract bid price.

D. Alarm Initiating Devices:
1. Automatic Smoke and Heat Detectors:
    a. Photoelectric type duct smoke detectors shall be provided here but installed by persons skilled in that trade under Division 23.
        (1) Each duct mounted smoke detector shall have a remote indicating and test plate. Test plates shall be mounted flush with the ceiling or wall in an accessible location.
        (2) Duct mounted smoke detectors shall be powered through the fire alarm system and shall either provide an alarm signal or a supervised trouble signal as allowed by the local Authority Having Jurisdiction.
        (3) HVAC unit shutdown wiring shall be provided under Division 23. All other wiring for duct smoke detectors shall be provided under this specification section.
    b. Ceiling mounted smoke detectors shall be provided and installed here. Ceiling mounted detectors shall be photoelectric type.
    c. Ceiling mounted heat detectors shall be rate-of-rise type.
2. Manual Fire Alarm Boxes:
    a. Non-coded and double-action requiring two actions to initiate alarm. Breakable glass type are not approved.
    b. Box shall mechanically latch when actuated and require key to reset. Key shall match control panel door lock.

E. Alarm Indicating Devices:
   1. Combination Horn/Strobe:
      a. Wall mounted flush or semi-flush.
      b. Non-coded audible output of 90 dB minimum at 10 feet.
      c. Integrally mounted flashing light unit with block letters 'FIRE'. Minimum light intensity of 75 candela and flash rate between one and three Hertz.
      d. Listed under UL Standards 464 and 1971 and compliant with A.D.A. requirements.
      e. Mount 6'-8" above finished floor, or 6" below ceiling, whichever is lower.
      f. Audio & visual devices installed outdoors shall be rated for wet location.
   2. Strobe:
      a. Same as requirements above for Combination Horn/Strobe but without audible requirements. Mount 6'-8" above finished floor, or 6" below ceiling, whichever is lower.

F. Transient Voltage Surge Suppression:
   1. Provide surge suppression on each end of every conductor routed outside the building walls. Bond the surge suppression to the nearest grounded structure (building steel, metal conduit, or panelboard ground bus).
   2. Surge suppression shall be made accessible.
   3. Surge suppression shall be equal to those manufactured by Ditek.

PART 3 — EXECUTION

3.1 Installation:

A. Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions, and complying with applicable portions of NEC, NFPA and NECA's "Standard of Installation".

B. Program addressable point indicators in control unit indicating location and type of initiating device, i.e., HEAT PUMP #1 SMOKE, WAITING ROOM PULLSTATION, BREAKROOM SMOKE, etc.

C. Provide conduit stub-outs for wall mounted equipment and any location where cables are exposed (such as equipment rooms). Provide conduit sleeves where cables penetrate walls. **Plenum rated cables may be used above ceilings.**
   1. Fire alarm system conductors from different devices may be combined in common conduit. Make certain that raceway size and wire quantity, size, and type are suitable for equipment supplied and is within NEC standards.
   2. Label pull and junction boxes "F" with permanent marker.
   3. All cable splices shall be located within junction boxes.

D. Well grounded Ditek type surge protection shall be installed on every conductor that connects to a device outside the building walls.

E. Loop wires through each device on zone for proper supervision. Tee-taps are not permitted unless specifically allowed in writing by the manufacturer.

F. Provide dust protection for installed smoke detectors until finish work is completed and building is ready for occupancy.

G. Protect conductors from cuts, abrasion and other damage during construction.

H. Minimum conductor size shall be 14 AWG unless otherwise specified or recommended by the manufacturer.

I. Do not install manual fire alarm boxes close to light switches.

J. Post copy of wire identification list inside fire alarm panel door or other area accessible to fire alarm service personnel.

3.2 Field Quality Control:

A. Manufacturer's Field Service:

1. Provide factory trained representative to perform complete system testing in presence of Owner's representative and local fire department personnel upon completion of installation.
   a) Test each initiating and annunciating device for proper operation.
   b) Test operation of trouble annunciation on each circuit.
   c) Perform complete testing of control panel functions.
2. Provide one (1) can of testing smoke to the project electrical engineer.

B. Certification and Warranty:

1. Manufacturer's technician shall provide written certification that the system is operational and meets requirements of NFPA 72 and the specifications. NFPA 72 "Record of Completion" form shall be used and submitted.
2. Provide one (1) year on-site warranty of the system that was installed under this contract. Warranty shall include all parts, labor, and travel.

END OF SECTION 28 31 00

SECTION 31 10 00 — SITE CLEARING

PART 1 — 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. Provide all labor, materials, equipment and services required to complete all site clearing indicated on Drawings and specified herein.
  1. Removing existing trees, shrubs, groundcovers, plants, and grass.
  2. Clearing and grubbing.
  3. Stripping and stockpiling topsoil.
  4. Removing above- and below-grade site improvements.
  5. Disconnecting, capping or sealing, and abandoning site utilities in place.
  6. Temporary erosion and sedimentation control measures.
- B. Related Work Specified Elsewhere: Section 31 20 00 – Earth Moving.

1.3 Definitions:
- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

1.4 Material Ownership:
- A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 Submittals:
- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings, according to Division 1 Section "Project Record Documents", identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 Quality Assurance:
- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings".

1.7 Project Conditions:
- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 — PRODUCTS

NOT APPLICABLE

PART 3 — EXECUTION

3.1 Preparation:

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 Utilities:

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
   1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
   1. Arrange with utility companies to shut off indicated utilities.
   2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

E. Removal of underground utilities is included in Division 2 Sections covering site utilities.

3.3 Clearing and Grubbing:

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
   3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
   4. Use only hand methods for grubbing within tree protection zone.
B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.4 Topsoil Stripping:
A. Remove sod and grass before stripping topsoil.
B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
   1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
   2. Do not stockpile topsoil within tree protection zones.
   3. Dispose of excess topsoil as specified for waste material disposal.
   4. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

3.5 Site Improvements:
A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.6 Disposal:
A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
   1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

3.7 Temporary Erosion and Sedimentation Control:
A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control Drawings and in

accordance with requirements of authorities having jurisdiction, whichever is more stringent.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION 31 10 00

SECTION 31 20 00 — EARTH MOVING

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all earth moving indicated on Drawings and specified herein.
- B. Summary: This Section includes the following:
  1. Preparing of subgrade for building slabs, walks, and pavements.
  2. Excavating and backfilling of trenches within building lines.
- C. Related Work Specified Elsewhere: Section 31 10 00 - Site Clearing.

1.3 Definitions:
- A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be at Contractor's expense.
  1. Under footings, fill unauthorized excavation by extending indicated bottom elevation of footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect.
- C. Additional Excavation: When excavation has reached required subgrade elevations, notify Architect, who will make an inspection of conditions. If Architect determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Architect. The Contract Sum may be adjusted by an appropriate Contract Modification.
- D. Subgrade: The undisturbed earth or the compacted soil layer immediately below drainage fill.
- E. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

1.4 Submittals:
- A. Test Reports: Submit the following reports directly to Architect from the testing services, with copy to Contractor:
  1. Test reports on borrow material.
  2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
  3. Field reports; in-place soil density tests.
  4. One optimum moisture-maximum density curve for each type of soil encountered.

1.5 Quality Assurance:

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Testing and Inspection Service: Contractor shall employ and pay for a qualified independent geotechnical testing laboratory to perform soil testing and inspection service during earthwork operations.

C. Testing Laboratory Qualifications: To qualify for acceptance, the geotechnical testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct required field and laboratory geotechnical testing without delaying the progress of the Work. The testing laboratory shall employ on staff at least one registered engineer with experience in geotechnical engineering. The laboratory will provide a soils technician who has ACI and NRC certification. The laboratory will have a currently employed soils technician who is N.I.C.E.T. certified and has experience in asphalt testing.

1.6 Project Conditions:

A. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.

B. Use of Explosives: Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction.

C. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

PART 2 — PRODUCTS

2.1 Soil Materials:

A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

C. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, and natural or crushed sand.

D. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

PART 3 — EXECUTION

3.1 Excavation:

A. Excavation Classifications: The following classifications of excavation will be made when rock is encountered.

1. Earth excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
2. Rock excavation for trenches and pits includes removal and disposal of materials and obstructions encountered that cannot be excavated with a track-mounted power excavator. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.
3. Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping.
    a) Typical of materials classified as rock are boulders 1/2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.
    b) Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

B. Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified by Architect. Such excavation will be paid on basis of Contract Conditions relative to changes in work.

C. Rock payment lines are limited to the following:

1. Two feet outside of concrete work for which forms are required, except footings.
2. One foot outside perimeter of footings.
3. In pipe trenches, 6 inches below invert elevation of pipe and 2 feet wider than inside diameter of pipe, but not less than 3 feet minimum trench width.
4. Outside dimensions of concrete work where no forms are required.
5. Under slabs on grade, 6 inches below bottom of concrete slab.

3.2 Stability of Excavations:

A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progress.

3.3 Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

3.4 Storage of Excavated Materials: Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage.

3.5 Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.

A. Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed.

3.6 Trench Excavation for Pipes and Conduit: Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches of clearance on both sides of pipe or conduit.

3.7 Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.8 Backfill and Fill:

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.
   1. Under walks and pavements, use subbase material, satisfactory excavated or borrow material, or a combination.
   2. Under steps, use subbase material.
   3. Under piping and conduit and equipment, use subbase materials.
   4. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.

B. Backfill excavations as promptly as work permits, but not until completion of the following:
   1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
   2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
   3. Removal of concrete formwork.
   4. Removal of trash and debris from excavation.
   5. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.9 Placement and Compaction:

A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
   1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact required depth and percentage of maximum density.

B. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
C. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.
D. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Architect if soil density tests indicate inadequate compaction.
    1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density, in accordance with ASTM D 698 (Standard Proctor):
        a) Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 98 percent maximum density.
        b) Under lawn or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.
        c) Under walkways, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.
    2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material.
        a) Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

3.10 Grading:
A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.
B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes.
C. Grading Surface of Fill Under Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation.

3.11 Field Quality Control:
A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
    1. Perform field density tests in accordance with ASTM D 2922-81 (Nuclear method).
B. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test each 10 linear feet of footing and one test per isolated footing to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Architect. Testing is to be done as per ASTM STP 399 - Cone Pentrometer.
C. Paved Areas and Building Slab Subgrade: Perform at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab.

1. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area.
2. If in opinion of Architect, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and resting until specified density is obtained.

3.12 Erosion Control: Provide erosion control methods in accordance with requirement of authorities having jurisdiction.

3.13 Maintenance: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

3.14 Disposal of Excess and Waste Materials: Removal from Owner's Property: Remove excess excavated material, waste materials, trash, and debris, and dispose of it off Owner's Property.

END OF SECTION 31 20 00

SECTION 31 31 16 — TERMITE CONTROL

PART 1 — 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: Provide all labor, materials, equipment and services required for termite control herein specified.

1.3 Submittals:
- A. Product Data: Treatments and application instructions, including EPA-Registered Label.
- B. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Soil Treatment Report: After application of termiticide is completed, submit report for Owner's records information, including the following as applicable:
  1. Date and time of application.
  2. Moisture content of soil before application.
  3. Brand name and manufacturer of termiticide.
  4. Quantity of undiluted termiticide used.
  5. Dilutions, methods, volumes, and rates of application used.
  6. Areas of application.
  7. Water source for application.
- E. Warranties: Special warranties specified in this Section.

1.4 Quality Assurance:
- A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.
- B. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.
- C. In addition to requirements of these Specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

1.5 Project Conditions:
- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

1.6 Coordination:
A. Coordinate soil treatment application with excavating, filling and grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.7 Warranty:
A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
B. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
1. Warranty Period: Five years from date of Substantial Completion. This warranty shall include maintenance service during the 5-year warranty period.

PART 2 — PRODUCTS

2.1 Manufacturers: Subject to compliance with requirements, provide termiticide products by one of the following:
A. Aventis Environmental Science USA LP; Termidor.
B. Bayer Corporation; Premise 75.
C. Dow AgroSciences LLC; Dursban TC.
D. FMC Corporation, Agricultural Products Group; Torpedo.
E. Syngenta; Demon TC.

2.2 Soil Treatment:
A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

PART 3 — EXECUTION

3.1 Examination: Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.
A. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 Preparation:
A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer’s written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as

wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.
   1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 Application, General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 Applying Soil Treatment:
   A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.
      1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
      2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
      3. Crawlspaces: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platforms, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
      4. Masonry: Treat voids.
      5. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
   B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
   C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
   D. Post warning signs in areas of application.
   E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 31 31 16

SECTION 32 12 16 — ASPHALT PAVING

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of asphalt paving indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Section 31 10 00 - Site Clearing and Section 31 20 00 – Earth Moving.

1.3 Job Conditions:
- A. Weather Limitations:
  1. Apply prime and tack coats when ambient temperature is above 40 degrees F. and when temperature has not been below 35 degrees F. for twelve hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
  2. Construct asphalt concrete surface course only when atmospheric temperature is above 40 degrees F and when base is dry. Base course may be placed when air temperature is above 35 degrees F and rising.
- B. Grade Control: Establish and maintain required lines and elevations.

1.4 Quality Assurance:
- A. Installer Qualifications: Engage an experienced Installer ("Paver") to perform asphalt concrete paving work who has a minimum of 5 years experience in the installation of asphalt concrete paving work similar in size and scope to that required for this project. Hot-mix asphalt to be manufactured in an asphalt plant inspected and approved by the State of Alabama Department of Transportation.
- B. Installers Equipment Requirements:
  1. Bituminous Spreaders: Shall be self-propelled and equipped with a full width vibratory, or other compactive type, screed.
  2. Compaction Equipment: Shall be a minimum 10-12 ton roller or equivalent vibratory type roller.

PART 2 — PRODUCTS

2.1 Base: Furnish crusher-run limestone as indicated on the Drawings and conforming to Alabama Highway Department Specifications No. 301-A.

2.2 Hot-Mix Asphalt Surface Course: Intimate mixture of course and fine mineral aggregate and asphalt cement incorporated together in accordance with Alabama Highway Department Specification No. 425-A. See typical sections with thicknesses on Site Development Drawings.

PART 3 — EXECUTION

3.1 Examination:

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 Surface Preparation: Immediately before placing base material, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving base.

3.3 Base Course:

A. Provisions shall be made by the Contractor for furnishing water at the site of the work by equipment of ample capacity and of such design as to assure uniform application.
B. Grade control shall be by means of grade stakes, steel pins or other accepted means of good practice, and at intervals sufficiently close that strong lines or check boards may be placed between them.
C. The base material shall be uniformly blended during crushing operations or mixed in an approved plant. The plant shall blend and mix materials to meet these specifications and to the proper moisture content for compaction.
D. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations. Place material in maximum 6" layers.
E. Compacting: After spreading, the base course shall be compacted with a power roller weighing not less than ten tons and rolling shall continue until base material has been compacted to not less than 95 percent density as determined by test method AASHO T-99.
F. Base Tolerance: Surface of base course shall not vary from the specified grade more than one-half inch (1/2") in twenty-five feet (25') measured in any direction.

3.4 Hot-Mix Asphalt Placing:

A. General: Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 250 degrees F (121 deg C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness. Construction shall meet all requirements of Alabama Highway Department Specifications 414 for hot-mix asphalt base course and 416 for hot-mix asphalt surface course.
B. Paver Placing: Place in consecutive strips not less than 10' wide, except where infill edge strips of a lesser width are required. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.
C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 Joints:

A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
B. Offset longitudinal joints in successive courses a minimum of 6 inches (150mm).
C. Offset transverse joints in successive courses a minimum of 24 inches (600 mm).
D. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook".
E. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
F. Compact asphalt joints to a density within 2 percent of specified course density.

3.6 Compaction:

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers. Complete compaction before mix temperature cools to 185 deg F. (85 deg C).
B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.
C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
    1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
D. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.
E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 Installation Tolerances:

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
    1. Base Course: Plus or minus 1/2 inch (13 mm).
    2. Surface Course: Plus 1/4 inch (6 mm), no minus.
B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
    1. Base Course: 1/4 inch (6mm).

2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

END OF SECTION 32 12 16

SECTION 32 84 00 — PLANTING IRRIGATION

PART 1 — 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. The work included under these specifications shall consist of the furnishing of all materials, sprinkler equipment and labor necessary for the complete installation of the irrigation systems in accordance with the plans and specifications. It is the intent of these specifications and drawings to form a guide for a complete installation. Therefore, any items not specifically noted, but reasonably necessary for a complete installation, shall be furnished under this contract. The system shall efficiently and uniformly irrigate all areas and perform as required by these plans and specifications.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 22 Section "Plumbing" for water supply.
2. Division 26 Sections for electrical power, materials and installation.

1.3 System Performance Requirements:

A. Verification of Plans and Specifications: It shall be the responsibility of All Parties concerned to carefully examine the plans and specifications relating to this work for completeness, accuracy and clarity. Any conflict, errors or clarification requests shall be immediately brought to the attention of the Landscape Architect for written interpretation or instructions. No claim for increased compensation for additions, changes or alterations will be considered unless written authorization is granted by the Landscape Architect. Otherwise, any additional materials and/or labor due to additions, alterations, and changes necessary to meet existing conditions shall be furnished under this contract.

B. Location of Sprinklers and Devices: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards.

C. Minimum Water Coverage: No less than:

1. Turf Areas: 100 percent.
2. Other Planting Areas: 100 percent.

1.4 Submittals:

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data including pressure rating, rated capacity, settings and electrical data of selected models for the following:

1. Backflow preventers, including test equipment.
2. Valves, including general-duty, underground, manual and automatic control and quick-coupler types, and valve boxes.
3. Sprinklers.

4. Controls, including controller wiring diagrams.
5. Wiring.
6. Area drains.

C. Wiring diagrams for electrical controls, valves and devices.

D. Maintenance data for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout" for the following:
1. Backflow preventers, including instructions for testing.
2. Automatic control valves.
3. Sprinklers.
4. Controllers.

E. Record Drawings: The Contractor shall maintain at least one set of "working prints" for annotating all installations on the plans. These shall be carefully recorded and kept up to date daily throughout the progress of the job to completion of the project, whereupon they shall be returned to the Landscape Architect for preparation of the final "as built" plans which will provide a permanent record of this work.

1.5 Quality Assurance:

A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage.

B. Comply with requirements of authority with jurisdiction for irrigation systems.

C. Installer Qualifications: Engage an experienced Installer who has completed irrigation systems similar in materials, design and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

D. Product Options: Irrigation system piping, specialties and accessories are based on specific types, manufacturers and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation and other characteristics do not change design concept or intended performance as judged by the Landscape Architect. The burden of proof of product equality is on the Contractor. Refer to Division 1 Section "Product Substitutions."

1.6 Project Conditions:

A. Perform site survey, research public utility records and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards.

B. Site Information: Reports on subsurface condition investigations made during design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

C. Working Conditions:
1. It shall be the responsibility of All Parties concerned to visit the irrigation job site and fully inform themselves as to all existing conditions and/or limitations relating to this work. No claim for increased compensation shall be considered for changes or alterations due to visible or obvious conditions.
2. The Contractor shall confine his operations, storage and equipment to the areas allotted him by the Owner for his work and materials.
3. The Contractor shall continuously maintain a competent superintendent to direct the work during progress, with the authority to act for him in all matters pertaining to the work.

4. All work shall progress as rapidly and diligently as possible and practical without unnecessary delays. Precautions necessary to provide reasonable safety for all persons, materials and equipment involved in this work shall be followed.

1.7 Sequencing and Scheduling:
- A. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shutoff with Owner.
- B. Coordinate irrigation systems work with landscape work specified in Division 2 Section "Landscape Work".

1.8 Project Warranty:
- A. All materials and equipment shall be guaranteed in writing for a period of one year against defects in materials and workmanship from their respective manufacturers. All installation work shall be warranted for a period of one year against defective workmanship and handling by the installer. Warranties shall become effective on the day the system, or any portion thereof, is put into operation.
- B. If the installation work does not strictly conform with the specifications and plans, except for approved changes, and/or the system is not operated in accordance with the instructions provided, the manufacturing and engineering warranties shall be void.
- C. The Owner shall be responsible for the operation, minor adjustments and minor maintenance during the warranty period. However, the Contractor shall be responsible for assisting on any problems that the Owner needs expertise on during the warranty period.

PART 2 — PRODUCTS

2.1 Manufacturers: Subject to compliance with requirements, provide products by Rain Bird Sprinkler Mfg. Corporation or approved equal.

2.2 Pipes and Tubes:
- A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube materials specified below are used.
- B. Polyvinyl Chloride (PVC) Plastic Pipe: ASTM D 1785, PVC 1120, Schedule 40, with plain ends.

2.3 Pipe and Tube Fittings:
- A. Refer to Part 3 Article "Piping Applications" for identification of systems where pipe and tube fitting materials specified below are used.
- B. Polyvinyl Chloride (PVC) Plastic Pipe Fittings: ASTM D 2466, Schedule 40, socket-type.

2.4 Joining Materials:
- A. Refer to Division 22 Section "Plumbing" for joining materials not included in this Section.
- B. Solvent Cement: ASTM F 656 primer and ASTM D 2564 solvent cement in color other than orange.
- C. Solder: ASTM B 32, Alloys Sn95 and E.

2.5 Backflow Preventers:

A. Description: ASSE Standard backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.
   1. Working Pressure: 150 psig (1035 kPa) minimum except where otherwise indicated.
   2. 2-1/2 Inches (65 mm) and Larger: Bronze, cast-iron, steel or stainless steel body with flanges ends.
      a) Interior Protective Coating: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.
   3. Interior Components: Corrosion-resistant materials.

B. Double-Check Backflow Prevention Assemblies: ASSE 1015, with shutoff valves on inlet and outlet and strainer on inlet. Include test cocks with 2 positive-seating check valves for continuous pressure application.

C. Gate valves supplied with and compatible for size and testing of unit on inlet and outlet. Valves 2 inches (50 mm) and smaller may be ball valves if these are unit manufacturer's standard valve for this application.

2.6 Control Valves:

A. Automatic Control Valves: Rainbird diaphragm-type, normally closed, with manual flow adjustment and operated by 24-volt-a.c. solenoid.

B. Control Valve Boxes: Polyethylene (PE), acrylonitrile-butadiene-styrene (ABS), fiberglass, polymer concrete or precast concrete box and cover. Size as required for application.

2.7 Sprinklers:

A. Pop-Up Spray: Rainbird 1800 Series/SAM fixed pattern, with screw-type flow adjustment and stainless steel retraction spring.

B. Pop-Up, Rotary Impact: Rainbird 5000 Plus Series, full circle and part circle as indicated.

2.8 Automatic Control System:

A. Controller: Rainbird "Turfmaster" 24 station electro-mechanical low-voltage controller system, made for control of irrigation system automatic control valves. Controller operates on 120 volts a.c. building power system, provides 24 volts a.c. power to control valves. Provide with Rainbird "Raincheck".

B. Wiring: UL 493, solid copper conductor, insulated cable, suitable for direct burial.
   1. Feeder Circuit Cables: Type UF, No. 12 AWG minimum, between building and controllers.
   2. Low-Voltage, Branch Circuit Cables: Type UF, No. 14 AWG minimum, between controllers and automatic control valves. Jacket color is other than feeder-circuit-cable jacket color. Furnish cables with jackets of different colors for multiple cable installation in same trench.
   3. Splicing Materials: Pressure-sensitive thermoplastic tape and other materials required to make specified connections.

PART 3 — EXECUTION

3.1 Examination:

A. Investigate and determine available water supply water pressure and flow characteristics.

B. Workers shall be knowledgeable in regards to the performance, operation, installation procedures and handling of the materials and equipment that they will be working with. All mechanical equipment operators shall be reminded of the hazards and safety precautions in regards to the equipment they will be using.

3.2 Location Staking: The location of all sprinklers, valves, piping and principal fittings shall be staked out by the Contractor. The Landscape Architect shall approve said staking as being per plans. All staking and measurements shall be taken from permanent objects, buildings, etc.; or survey bench markers and not from objects such as turf boundaries, etc.; which are subject to change. All measurements shall be made in feet and inches. Fractions may be rounded to the nearest inch. As the staking progresses, all additions, changes or equipment locations, whether or not necessitating an increase or decrease in compensation shall be noted on the copy of the "working plans" from which the "As built drawings" will be made.

3.3 Excavation: The Contractor shall do all necessary excavation for the proper installation of his work. Mechanical trench diggers used on this site shall be of an approved type to cut smooth-bottom trenches on uniform slopes. Trenches shall be no wider than is necessary to lay pipe, except that extra working space shall be provided where necessary to make joints. Boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth of 6" below the trench bottom. Over-excavating shall be back-filled and carefully tamped to provide a smooth and firm-bearing surface for laying the pipe.

3.4 Piping Applications:

A. Refer to Part 2 of this Section detailed specifications for pipe and fittings products listed below. Use pipe, tube, fittings and joining methods according to the following applications.
   1. All Sizes: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent cemented joints.
   2. Sleeves: ASTM D 1785, Schedule 40, polyvinyl chloride (PVC) plastic pipe; ASTM D 2466, Schedule 40, PVC plastic, socket-type fittings; and solvent-cement joints.

3.5 Joint Construction:

A. Polyvinyl Chloride (PVC) Piping Solvent-Cemented Joints: Construct joints according to ASTM D 2672 and ASTM D 2855.
   1. Handling of Solvent Cements, Primers and Cleaners: Comply with procedures in ASTM F 402 for safe handling when joining plastic pipe and fittings with solvent cements.

B. Dissimilar Materials Piping Joints: Construct joints using adapters that are compatible with both piping materials, outside diameters and system working pressure.

3.6 Piping Systems - Common Requirements:

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss and in other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

B. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
C. Install fittings for changes in direction and branch connections.

3.7 Piping Installation:
A. Install underground polyvinyl chloride (PVC) plastic pipe according to ASTM D 2774.
B. Lay piping on solid subbase, uniformly sloped without humps or depressions.
1. Slope circuit piping down toward drain valve minimum of 1/2 inch in 10 feet (1:240).
C. Install polyvinyl chloride (PVC) plastic pipe in dry weather when temperature is above 40 deg F (4 deg C). Allow joints to cure at least 24 hours at temperature above 40 deg F (4 deg C) before testing, unless otherwise recommended by manufacturer.
D. Minimum Cover: Provide following minimum cover over top of buried piping:
1. Circuit Piping: 12 inches (300 mm).
2. Drain Piping: 12 inches (300 mm).
3. Sleeves: 24 inches (600 mm).
E. Install piping under sidewalks and paving in sleeves.

3.8 Valve Installation:
A. Valves: Install underground valves in valve boxes or pits.
B. Control Valves: Install in valve control valve boxes, arranged for easy adjustment and removal. Install union on downstream side.

3.9 Backflow Preventer Installation:
A. Install backflow preventers of types, size and capacity indicated. Include valves and test cocks. Install according to plumbing code and health department authorities with jurisdiction.
B. Do not install bypass around backflow preventer.

3.10 Sprinkler Installation:
A. Sprinklers: Flush circuit piping with full head of water and install sprinklers after hydrostatic test is completed.
1. Install lawn sprinklers at manufacturer's recommended heights.
2. Locate part-circle sprinklers to maintain a minimum distance of 4 inches (100 mm) from walls and 2 inches (50 mm) from other boundaries, unless otherwise indicated.

3.11 Automatic Control System Installation:
A. Install controller according to manufacturer's written instructions and as indicated.
B. Install control wiring in same trench with piping. Wires are to be twisted and taped to bottom of irrigation pipe where possible.
C. All underground splices or connections are to be soldered with rosin core solder and then sealed with Scotchcast splicing kits. If the Contractor desires, all low voltage underground splices or connections may be sealed by:
1. Wrapping with Scotchfill.
2. Wrapping with Scotch #33 tape.
3. Sealing with vinyl sealer.
4. Rewrapping with Scotch #33 tape.
5. Resealing with vinyl sealer.
D. Control wire shall be specifically designed for direct burial use. A minimum loop of 24" shall be left at each valve, at each splice, at each change in directions and at

each controller for expansion and/or servicing. Wire shall be placed consistently along bottom side of the pipe in the trench. Splices shall be watertight and leak proof. Wire shall be within a protective sleeve or conduit for bridge or water crossings or where other conditions make it necessary. Multiple wires in the trenches shall be banded together at intervals for protection.

3.12 Field Quality Control:

A. Testing: Perform hydrostatic test of piping and valves before backfilling trenches. Piping may be tested in sections to expedite work.
   1. Cap and subject the piping system to a static water pressure of 50 psig (345 kPa) above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
   2. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.

3.13 Cleaning and Adjusting:

A. Flush dirt and debris from piping before installing sprinklers and other devices.
B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.
C. Carefully adjust lawn sprinklers so they will be flush with, or not more than 1/2 inch (13 mm) above, finish grade after completion of landscape work.
D. Adjust settings of controllers and automatic control valves.

3.14 Demonstration:

A. Demonstrate to Landscape Architect that system meets coverage requirements and that automatic controls function properly.
B. Demonstrate to Owner's maintenance personnel operation of equipment, sprinklers, specialties and accessories. Review operating and maintenance information.
C. Provide 7 days' written notice in advance of demonstration.

END OF SECTION 32 84 00

SECTION 32 93 00 — PLANTS

PART 1 — 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. Provide all labor, materials, equipment and services required for complete installation of all plants indicated on Drawings and specified herein.
- B. Related Work Specified Elsewhere: Section 31 10 00 – Site Clearing, Section 31 20 00 – Earth Moving and Section 32 84 00 – Planting Irrigation.

1.3 Quality Assurance:
- A. The following specifications and standards of the issues listed and referred to in this section form a part of this specification to the extent required by reference thereto:
  1. Standardized Plant Names, Second Edition, American Joint Committee on Horticultural Nomenclature, 1942.
  2. American Standard for Nursery Stock, American Association of Nurserymen, Inc., 1973 (ANSI Z 60.1).
- B. Trees and Shrubs: Provide trees and shrubs grown in a recognized nursery in accordance with good horticultural practice. Provide healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions, or disfigurement. Provide trees and shrubs of sizes shown or specified. Trees and shrubs of larger size may be used if acceptable to Architect, and if sizes of roots or balls are increased proportionately.
- C. Manufacturers Qualifications: Provide underground irrigation system as a complete unit produced by a single acceptable manufacturer, including heads, valves, controls, and accessories.

1.4 Submittals:
- A. Maintenance Instructions: Submit typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

1.5 Delivery, Storage and Handling:
- A. Sod: Time delivery so that sod will be placed within 24 hours after stripping. Protect sod against drying and breaking of rolled strips. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery.
- B. Deliver trees and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage and keep roots moist.
- C. Do not remove container grown stock from containers until planting time.

1.6 Job Conditions:

A. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

B. Utilities: Determine location of underground utilities and perform work in a manner that will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

D. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.

1. Planting Seasons:

a) Bermuda Sod: April 1 – September 30

b) Holly Shrubs: November 1 - March 31

c) Trees: November 1 - March 31

d) Other periods subject to Architect's approval.

E. Coordination with Lawns: Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to Architect. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from plant operations.

1.7 Special Project Warranty:

A. Warranty lawns through specified maintenance period, and until final acceptance.

B. Warranty trees and shrubs through specified maintenance period, and until final acceptance.

C. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition during warranty period. Make replacements during growth season following end of warranty period. Replace trees and shrubs that are in doubtful condition at end of warranty period; unless, in opinion of Architect, it is advisable to extend warranty period for a full growing season.

PART 2 — PRODUCTS

2.1 Topsoil:

A. Any topsoil previously stripped and stored on site will be used by the General Contractor in his work; the layer of topsoil indicated below shall be brought to the site from off-site sources by the Landscape Contractor.

B. Provide 4" depth over all areas to be sodded and 18" depth over all areas to receive plants. Topsoil shall be fertile, natural soil of suitable loamy character obtained from naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from bogs or marshes. It shall contain a normal amount of decomposed matter, but be free of heavy clay, stones, roots and plants, and have a pH of 6 to 6.5. Furnish a soil test report prior to application.

C. Rough grading by the General Contractor will be held down approximately 4" below the indicated grades (18" at planted areas). The Landscape Contractor shall verify and accept the condition, and thereafter level out, dress smooth, remove and dispose

of excess soil, so as to produce the proper bed to receive the topsoil, sod and planting materials specified.

2.2 Soil Amendments:

A. Fertilizer: Fertilizer shall conform to the applicable State fertilizer laws, and shall be 8-8-8 analysis. The fertilizer shall be delivered to the site in the original containers, unopened and bearing a guaranteed analysis fulfilling the requirements of the specifications.

B. Water: The Owner shall furnish water to the Landscape Contractor. The Landscape Contractor shall furnish all necessary hose, equipment, attachments and accessories for the adequate irrigation of planted areas as may be necessary to complete the work as specified. If water is needed for maintenance of planting areas after the Owner takes occupancy, the Owner will furnish water to the Landscape Contractor.

2.3 Plant Materials:

A. Quality and Size: Plants shall be in accordance with American Standard for Nursery Stock. All plants shall have normal habit of growth and shall be sound, healthy, vigorous and free from insect infestations. Any tree with a weak or thin trunk not capable of supporting itself when planted in the open will not be accepted. The minimum acceptable size of all plants, measured before pruning with branches in normal position, shall conform to dimensions as shown in the Plant List. Larger plants of equal quality may be accepted at no additional cost to the Owner.

B. Balled Plants: Plants designated "B&B" in the Plant List shall be adequately balled with firm, natural balls of soil in sizes as set forth in the American Standard for Nursery Stock. Balls shall be firmly wrapped with jute burlap weighing not less than 7.2 ounces per square yard (or other approved strong cloth of equal strength and resistance to tearing) and then laced with a suitable heavy twine. No balled plant shall be planted if the ball is cracked or broken either before or during the process of planting.

C. Container Grown Plants: All plants designated container grown in the Plant List shall be healthy, vigorous, well rooted and established in the container in which they are sold. They shall have tops that are of good quality and shall be in a healthy growing condition. An established container grown plant shall be a plant transplanted into a container and grown in the container sufficiently long for the new fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container. The container shall be sufficiently rigid to hold the ball shape protecting the root mass during shipping. No root bound container grown plants, as determined by the Architect, will be permitted.

2.4 Grass Materials:

A. Sod: Provide strongly rooted sod, not less than 2 years old and free of weeds and undesirable native grasses. Provide only sod capable of growth and development when planted (viable, not dormant). Sod shall be 419 Tifton Bermuda as specified on the Drawings.

B. Grass Seed: Provide fresh, clean, new crop Common Bermuda seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Provide seed mixture composed of grass species, proportions and minimum percentages of purity, germination and maximum percentage of weed seed, as specified.

2.5 Ground Cover: Provide plants established and well-rooted in removable containers or integral peat pots and with not less than minimum number and length of runners required by ANSI Z60.1 for the pot size shown or listed.

2.6 Miscellaneous Landscape Materials:

A. Stakes and Guys: Provide stakes and deadmen of sound new hardwood, treated softwood, or redwood free of knot holes and other defects. Provide wire ties and guys of 2-strand, twisted, pliable galvanized iron wire not lighter than 12 gauge with zinc-coated turnbuckles. Provide not less than 1/2" hose, cut to required lengths to protect tree trunks from damage by wires.

B. Mulch: Pine needles, 4" deep.

C. Steel Edging: ASTM A 569 (ASTM A 569M), rolled edge, standard steel edging, fabricated in sections with loops stamped from or welded to face of sections approximately 30 inches apart to receive stakes.

1. Edging Size: 3/16 inch (4.8mm) wide by 4 inches (102 mm) deep.
2. Stakes: Tapered steel, 15 inches (381 mm) long.
3. Accessories: Standard tapered ends, corners, and splicers as required.
4. Tree Rings: Provide 3'-0" diameter steel edging tree rings at all trees and treeform shrubs.
5. Finish: Standard paint finish, green color.

PART 3 — EXECUTION

3.1 Preparation:

A. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure Architect's acceptance before start of planting work. Make minor adjustments as may be requested.

B. Preparation for Planting Lawns:

1. Loosen subgrade of lawn areas to a minimum depth of 6". Remove stones over 1-1/2" in any dimension and sticks, roots, rubbish and other extraneous matter. Limit preparation to areas that will be planted promptly after preparation.
2. Spread topsoil to minimum depth required to meet lines, grades and elevations shown, after light rolling and natural settlement.
3. Grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas that can be planted immediately after grading.
4. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.

C. Preparation of Planting Beds:

1. Loosen subgrade of planting bed areas to a minimum depth of 6" using a cultimulcher or similar equipment. Remove stones over 1-1/2" in any dimension, and sticks, roots, rubbish and other extraneous matter.
2. Spread planting soil mixture to minimum depth required to meet lines, grades and elevations shown, after light rolling and natural settlement. Place approximately 1/2 of the total amount of planting soil required. Work into top of loosened subgrade to create a transition layer, than place remainder of the planting soil.

3.2 Planting:

A. Planting Trees and Shrubs:
   1. Prepare pits as specified and as shown on the Drawings prior to inserting plants. Set plants at the same relationship to finished grade as they were to the ground before being dug. Use topsoil mixture to backfill all plant pits. When plant pits have been backfilled approximately 2/3 full, water thoroughly before installing remainder of soil to top of pit.
   2. Set trees and shrubs plumb and brace rigidly in position until the planting soil has been tamped solidly around the ball and roots.
   3. Cut ropes or strings from top of balls after plant has been set. Leave burlap or cloth wrapping intact around balls. Turn under and bury top 1/2 of the burlap wrapping on the ball. Remove metal cage from root ball prior to planting.
   4. Ground cover shall be planted according to areas specified on plan in topsoil mixture as previously specified. All pits shall be adequate in depth and width to facilitate the root ball of the individual plant. Upon removing the containers, the soil should remain intact around the root system. Planting procedures should be followed as shown on the Drawings.
   5. Water all planting by hose immediately after planting.

B. Guying, Staking and Wrapping:
   1. Each tree over 1-1/4" in caliper shall be staked and tied with 12 gauge wire with reinforced garden hose material around tree trunk protecting the bark.
   2. Attention is directed to placement and number of guys, stakes, protecting hose sections, etc.

C. Pruning: All plant material shall be pruned as necessary at the site in accordance with standard modern horticultural practice as approved by the Architect. Cuts over 1/4" in diameter shall be painted with wood sealer. Additional pruning may be required as directed by the Architect.

3.3 Grassing (Sod):

A. Apply fertilizer uniformly at the rate of 4 lbs. per 1000 square feet to areas to be sodded.
B. Lay sod within 24 hours from time of stripping. Do not plant dormant sod or if ground is frozen.
C. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.
D. Anchor sod on slopes with wood pegs to prevent slippage.
E. Water sod thoroughly with a fine spray immediately after planting.

3.1 Seeding New Lawns:

A. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
B. Sow seed using a spreader or seeding machine. Do not seed when wind velocity exceeds 5 mi. per hr. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.
C. Sow not less than 5 lbs./1000 sq. ft. of seed specified.
D. Rake seed lightly into top 1/8" of soil, roll lightly, and water with a fine spray.

F. Protect seeded areas against erosion by spreading lawn mulch after completion of seeding operations. Spread uniformly to form a continuous blanket not less than 1-1/2" loose measurement over seeded areas.

3.4 Installation of Edgings:
A. Install steel edging where indicated according to manufacturer's recommendations. Anchor with steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging.
B. Install 3'-0" diameter steel edging tree ring at all trees and treeform shrubs.

3.5 Maintenance:
A. Begin maintenance immediately after planting.
B. Maintain trees, shrubs and other plants until final acceptance, but in no case less than 30 days after substantial completion of planting.
C. Maintain sodded lawns not less than 30 days after substantial completion.
D. Maintain lawns by watering, fertilizing, weeding, mowing, trimming and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

3.6 Cleanup and Protections:
A. During landscape work, keep pavements and walks clean and work area in an orderly condition.
B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

3.7 Inspection and Acceptance:
A. When landscape work is completed, including maintenance, Architect will, upon request make an inspection to determine acceptability.
B. Landscape work may be inspected for acceptance in parts agreeable to Architect, provided work offered for inspection is complete, including maintenance.
C. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

END OF SECTION 32 93 00

SECTION 33 41 00 — STORM UTILITY DRAINAGE PIPING

PART 1 — 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: Provide all labor, materials, equipment and services required for complete installation of all storm utility drainage piping indicated on Drawings and specified herein.

1.3 Submittals:
- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for the following:
  1. Storm water disposal systems.
- C. Shop drawings for precast concrete manholes and other structures. Include frames, covers, and grates.

1.4 Quality Assurance:
- A. Environmental Agency Compliance: Comply with regulations pertaining to storm sewerage drainage systems.
- B. Utility Compliance: Comply with regulations pertaining to storm sewerage systems. Include standards of water and other utilities where appropriate.

1.5 Delivery, Storage and Handling:
- A. Do not store plastic structures in direct sunlight.
- B. Do not store plastic pipe or fittings in direct sunlight.
- C. Protect pipe, pipe fittings, and seals from dirt and damage.
- D. Handle precast concrete manholes and other structures according to manufacturer's rigging instructions.

1.6 Project Conditions:
- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utilities.
  1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without receiving Architect's written permission.

1.7 Sequencing and Scheduling:
- A. Coordinate storm drainage system connections to utility company's storm sewer.

B. Coordinate storm drainage system connections to existing on-site storm sewer.
C. Coordinate with other utility work.

PART 2 — PRODUCTS

2.1 Polyvinyl Chloride (PVC) Storm Drain Pipe: ASTM D 3033, Type PSP, SDR 35; fittings shall be PVC, ASTM D 3033 or ASTM D 3034, Type PSM, SDR 35. Fittings shall be PVC, ASTM D 3033 or D 3034, rubber gasket slip joints complying with ASTM D 3212.

2.2 Concrete: Cast-in-place concrete which will attain a 28 day compressive strength of not less than 3000 psi.

2.3 Crushed Stone: Crusher-run limestone, with 3/4" maximum size aggregates.

PART 3 — EXECUTION

3.1 Installation of Pipe and Pipe Fittings:
A. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.
B. Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.
C. Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.
D. Place bell ends of groove ends of piping facing upstream.
E. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.
F. Cleaning Piping: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.
G. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
H. Joint Adapters: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.
I. Flush lines between manholes if required to remove collected debris.

3.2 Backfilling: Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

3.3 Field Quality Control: Perform testing of completed piping in accordance with local authorities having jurisdiction.

3.4 Tap Connections:
A. Make connections to existing piping and underground structures, so that finished work will conform as nearly as practicable to requirements specified for new work.
B. For branch connections from side into existing 24" or larger piping, or to underground structures, cut opening into unit sufficiently large to allow 3" of concrete to be packed around entering connection. Cut ends of connection passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6" of concrete for minimum length of 12" to provide additional support or collar from

connection to undisturbed ground. Use epoxy bonding compound as interface between new and existing concrete piping materials.

C. Take care while making tap connections to prevent concrete or debris from entering existing piping or structure. Remove debris, concrete, or other extraneous material that may accumulate.

END OF SECTION 33 41 00